Available in English Only
Disponible en Anglais
seulement

Guidlines For Offshore Marine Protected Areas In Canada

Evelyne Meltzer

Meltzer Research and Consulting
1331 Brenton Street
Halifax
Canada B3J 2K5

emeltzer@fox.nstn.ca

Oceans Conservation Report Series

Integrated Coastal Zone Management - Marine Protected Areas - Marine Environmental Quality

Departement of Fisheries and Oceans
200 Kent Street
Ottawa, Ontario K1A 0E6

1998

---

[*] Evelyne Meltzer, President of Meltzer Research and Consulting, is an international marine lawyer and independent oceans consultant based in Halifax, Nova Scotia, Canada. She is a part time faculty member at Dalhousie Law School where she teaches Coastal Zone Management.

The Oceans Conservation Report Series is a newly established series published by Canada's Department of Fisheries and Oceans (DFO), as part of the 1998 International Year of the Oceans' celebrations. This report series is intended to serve a broad audience interested in coastal and oceans issues affecting Canada and the global coastal community. The subject matter reflects DFO's evolving interests and policies, pursuant to the *Oceans Act* (1996), in three key areas: Integrated Coastal Zone Management; Marine Protected Areas; and Marine Environmental Quality.

The views expressed in each report are solely those of the respective authors, and should not be characterized as reflecting the views or policies of the Department of Fisheries and Oceans nor the Government of Canada.

The Oceans Conservation Report Series may be cited as full publications. The correct citation appears in each individual report. Copies may be obtained from the Department of Fisheries and Oceans, Ottawa.

GUIDELINES FOR OFFSHORE MARINE PROTECTED AREAS IN CANADA

Evelyne Meltzer
Meltzer Research and Consulting
1331 Brenton Street
Halifax, Nova Scotia
Canada B3J 2K5
emeltzer@fox.nstn.ca

1998

Published By	Department of Fisheries and Oceans 200 Kent Street Ottawa Ontario Canada K1A 0E6
Copyright	© 1998 Minister of Public Works and Government Services Canada Canadian Technical Report of Fisheries and Aquatic Sciences 2210
Citation	Meltzer, E. 1998. *Guidelines for Offshore Marine Protected Areas in Canada*. Oceans Conservation Report Series. Can. Tech. Rep. Fish. Aquat. Sci. 2210. Ottawa, Ontario: Department of Fisheries and Oceans.
ISSN	1480-8005 (print) 1480-8013 (Internet)

Acknowledgments

In 1997, following a competitive process, the Department of Fisheries and Oceans contracted Meltzer Research and Consulting to prepare an earlier version of this report. The views expressed in both the 1997 Report and this updated paper are solely those of the author, Evelyne Meltzer.

In researching and developing these guidelines, several individuals provided useful comments and suggestions for which I am very grateful. I would like to thank Mr. Sam Baird, Dr. Bill Ballantine, Mr. Brad Barr, Dr. Dr. Jon Lien, Mr. Andrew Montgomery, Mr. Richard Paisley, Cheri Recchia, Dr. Rod Salm, Dr. Kath Shurcliff, and Dr. Martin Willison for taking the time to read the drafts and share their wisdom and perspectives based on years of experience. All comments were carefully considered though the final document does not necessarily reflect their views. I wish to acknowledge the important contribution of Ms. Leslie Beckmann and Dr. Susan Gubbay in drafting Guidelines 13, 14, 15, 16 and 17, and my research assistant Ms. Maria Recchia for assisting with the compilation of international materials needed to undertake this assignment.

I also would like to note the contribution provided by Dr. Susan Gubbay, Mr. Stefan Leslie, and Ms. Maria Recchia in preparing the Matrices in Section C. Several individuals reviewed and assisted in the preparation of individual matrices. Special thanks to Dr. Alan Baker, Dr. Bill Ballantine, Dr. Chris Bleakley, Dr. John Clark, Mr. Jon Day, Dr. Harald Marenoic, Dr. Craig Millar, Dr. David Suman, Dr. Alan White, and Dr. Martin Willison for their efforts in this regard. I am also grateful to Ms. Jean Blane, Mr. David McBurney and Ms. Eleanor Zurbrigg for reviewing Figure 2 comparing the Canadian legal framework.

I would like to thank Mr. Stefan Leslie for assisting with the technical edit for the Oceans Conservation Report Series and to Mr. David Dzordzomo for kindly agreeing to review the updated version.

Abstract

During the 1990s, concern over anthropogenic impacts on the marine environment has grown from a minority interest to a global movement for marine conservation and protection. Uncontrolled human use, particularly with the advent of modern technology and the dramatic increase in global population, have resulted in widespread depletion and degradation of ocean resources and marine habitats. Protecting areas are increasingly regarded as an essential tool in controlling activities and safeguarding marine ecosystems. Over 1,000 Marine Protected Areas (MPAs) have been designated and established throughout the world. Marine reserves offer diverse types of protection: providing protection for critical nursery areas or sensitive habitats; refuge from overfishing of intensively harvested species; conservation and protection of marine biodiversity; or creating control sites as ecological benchmarks or references against which we may monitor and measure human impacts and environmental trends. In addition to their conservation functions, MPAs can also provide important education, recreation and economic opportunities.

This paper surveys and reviews the literature available on marine protected areas, and examines how DFO might apply the international experience and lessons learned to create and manage offshore MPAs in Canada. The first section reviews the international and legal frameworks and the general principles for creating MPAs. The second section contains 29 guidelines for selecting, establishing and monitoring offshore MPAs in Canada. The third and final section illustrates key issues in matrix format, such as objectives, site selection, public participation, and enforcement, of eight offshore marine protected areas from around the world.

Table of Contents

A. BACKGROUND, PRINCIPLES AND LEGAL FRAMEWORK

1. BACKGROUND AND ISSUES 9

Introduction 9
Why Offshore Marine Protected Areas? 10
Defining Marine Protected Areas 12
Legal Framework for the Establishment of MPAs 13
Coastal States' Duty to Protect the Environment *vs.* Freedom of Navigation 15

2. MARINE PROTECTED AREAS IN INTERNATIONAL LAW 15

Overview 15
The Convention on Biological Diversity 15
The Jakarta Mandate 19
UN Agreement on Straddling Fish Stocks 19
MARPOL 73/78 19
International Civil Aviation 21

3. CANADIAN LEGAL FRAMEWORK FOR ESTABLISHING MPAS 28

4. GENERAL PRINCIPLES FOR ESTABLISHING OFFSHORE MPAS 28

Importance of the Environment 28
Environmental Security 28
Sustainable Development 29
Integrated Ocean Management 31
The Precautionary Approach 32

B. GUIDELINES

5. A NATIONAL FRAMEWORK FOR OFFSHORE MPAS 39

Integrated Ocean Governance 39
A System of National MPAs 42
Collaborative and Participatory Strategy Development 46
Funding 50
Multi-Stakeholder Institutional Arrangement 51
Integrated, Strategic, Multi-Stakeholder Research Program 53

6. IDENTIFYING, SELECTING AND DESIGNING OFFSHORE MPAS 54

Overview 54
Nomination 55
Selection Criteria 56
Information Considerations 58
Preliminary Area Management Plan 62
Boundaries 69

7. ESTABLISH MPA REGULATIONS 71
Drafting MPA Regulations 71
Announcing Offshore MPA 71

8. **MANAGING OFFSHORE MPAS** ... 71

Appropriate, Collaborative and Timely, Adaptive Management ... 71
Public Participation, Education and Outreach ... 74
Compliance/Enforcement ... 75
Dispute Resolution ... 75

9. **RESEARCH, MONITORING AND REVIEW OF OFFSHORE MPAS** ... 76

Appendix 1: Sections 35 and 36 of the *Oceans Act* ... 77

C MATRICES

Biosphere Reserve ... 79
World Heritage Site ... 85
Great Barrier Reef Marine Park, Australia ... 89
Kermadec Marine Sanctuary, New Zealand ... 97
Stellwagen Bank National Marine Sanctuary, USA ... 101
Florida Keys National Marine Sanctuary, USA ... 107
Wadden Sea, North Sea ... 112
Apo Island Reserve, Philippines ... 118

Notes ... 121

GUIDELINES FOR OFFSHORE MARINE PROTECTED AREAS IN CANADA

Evelyne Meltzer[*]

A. BACKGROUND, PRINCIPLES AND LEGAL FRAMEWORK

1. BACKGROUND AND ISSUES

Introduction

The use of protected areas for terrestrial conservation and management is a well accepted and common practice throughout the world. There are many reasons for designating public lands for parks, reserves, wildlife management areas, sanctuaries, and special places. Uncontrolled human settlement and use, particularly with the advent of modern technology and the dramatic increase in global population, have resulted in widespread alienation and degradation of natural resources. As a result, throughout the world some land is set aside to conserve and protect wildlife and wildlife habitat. Other lands are set aside so as not to forfeit resource development options in the future. Still other lands are allocated for the purpose of recreation, aesthetics and/or enjoyment of the natural environment for present and future generations. As we move into the next millennium, maintaining a healthy environment and conserving biodiversity are two critical global concerns. Protected areas are widely regarded as an essential tool in controlling human activities and safeguarding terrestrial ecosystems.

The marine environment is a complex and dynamic natural system in which the lack of adequate control of human activity has led to the 'tragedy of the commons'.[1] The more recent recognition of the profound impact of humans on marine systems has led to the creation of new international laws and guidelines for ocean governance. The Convention on the Law of the Sea (CLOS) (United Nations, 1982), the Convention on Biological Diversity (CBD) (United Nations, 1992), the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA) (UNEP, 1995), and the UN Convention on Straddling Stocks and Migratory Stocks (United Nations, 1995) are major global initiatives that have come into force or were concluded in the last five years. These agreements and conventions provide for marine environmental protection and the sustainable use of natural resources. An important tool, recognized in these international legal instruments, is the establishment of marine reserves and protected areas within the Exclusive Economic Zones of coastal States and on the high seas.

Protecting areas in ocean space is still a young idea, but one which has won rapid endorsement. The designation and establishment of such marine protected areas (MPAs) has expanded dramatically over the last three decades (Kelleher *et al.*, 1995). The first marine protected area was established in 1935 in Florida (Gubbay, 1995). By 1970, there were 118 MPAs in 27 nations. By 1985, 430 MPAs had been proclaimed by 69 nations. There are now over 1000 MPAs in over 80 countries (Kelleher and Kenchington, 1991:4). Compared to their terrestrial counterparts, there are still very few marine reserves. Less than one per cent of the marine area is presently within established protected areas (Kelleher and Kenchington, 1991: 7). Given that the area of sea and seabed is more than two and a half times as great as the total area of land, there are proportionally even fewer. The challenge is to learn from the lessons and experience on land to better conserve, manage and protect our ocean ecosystems.

There is an extensive applied and theoretical basis for the application of the protected area concept on land. By contrast, the theoretical and empirical framework for MPA design is still developing, as is our understanding of ocean systems and processes. Scientific knowledge concerning the interactions between and within marine environments, and their connection to terrestrial activities and influences is fraught with uncertainty. As marine systems differ fundamentally from terrestrial systems in the scale and variability of processes, (Steele, 1985) the guidelines developed for terrestrial reserves are often not adequate and are difficult to adapt to the marine environment. These Guidelines for Offshore MPAs in Canada were prepared based on an international review of the literature and consultations with MPA experts in Canada and abroad. MPAs are now considered the "flagships of marine conservation in many parts of the world ... [and are] at the leading edge of the marine conservation programmes in many countries" (Gubbay, 1995). With the recent passage of the *Oceans Act* (Canada, 1996), DFO now has a legislative mandate for the development and implementation of MPAs in Canada for: the conservation and protection of commercial and non-commercial fishery resources and their habitats, marine ecosystem conservation and protection, and emergency care. Together with the protected area provisions under the *National Parks Act* (Canada, 1995a) and the *Canadian Wildlife Act* (Canada, 1995b), Canada is well-positioned to establish a national system of MPAs within its EEZ.

Why Offshore Marine Protected Areas?

> *Despite their importance to us, humankind is destroying marine populations, species and ecosystems. Leading marine scientists have concluded that the entire marine realm, from estuaries and coastal waters to the open ocean and the deep sea, is at risk.*
>
> (Norse, 1993)

In the last decade, concern about anthropogenic impacts on the marine environment has grown from a minority interest to a global cry for marine conservation and protection by coastal States, international organizations, non-governmental organizations (NGOs) and coastal communities. Marine environmental protection and the conservation of marine biodiversity are critical environmental issues. There are five principal reasons for this deterioration in the health of our oceans (Norse, 1993; Kelleher and Kenchington, 1991): overexploitation of living marine resources; degradation and destruction of critical coastal and marine habitats; sea-based and land-based sources of marine pollution; global climate change; and increased population. These problems are wide-spread and well known.

It is not just the intensely used coastal areas which have deteriorated. Species and habitats in the offshore environment once too remote to be affected by humans are now subjected to many threats. Options for protecting these marine ecosystems are quickly disappearing (Recchia and Broadhead, 1995). Marine protected areas (MPAs) are now regarded as essential for conservation efforts (Allison *et al.*, 1998) and an important tool to address global marine and marine biodiversity conservation (Norse, 1993). Marine reserves are strongly advocated by many managers and biologists because MPAs may offer types of protection not provided by other management strategies:

- specific protection of critical areas and sensitive habitats such as nursery grounds, spawning grounds, and foci of high species diversity (Salm and Clark, 1989; Norse, 1993; Allison *et al.*, 1998; Roberts, 1997);
- intrinsic prevention from overfishing by providing refuge to an intensively harvested species (Ballantine, 1995; Bohnsack, 1993; Davis, 1989; Dugan and Davis, 1993; Hutchings, 1995; Roberts, 1997; Roberts and Poulinin, 1993; Rowley, 1994; Walters and Maguire, 1996);
- enhancement of fisheries by acting as centres of dispersion of propagules (*i.e.* eggs and larvae) and adults into surrounding areas (Castilla and Fernandez, 1998; Roberts, 1997; McGarvey and Willison, 1995);
- a vital complement to conventional quota and/or effort management tools providing the needed insurance against 'overshoots in fishing effort', non-selective gear, and uncertain abundance estimates (Ballantine, 1995; Burke *et al.*, 1996; Walters and Maguire, 1996; Roberts, 1997);
- a management framework for sustainable multiple use (Agardy, 1995; Kenchington and Agardy, 1990); and
- control sites, serving as 'ecological benchmarks' or references against which human impacts and environmental trends can be monitored and measured (Allison *et al.*, 1998; Durán *et al.*, 1987; Keough *et al.*, 1993; Jon Lien pers. comm. 1997; Roberts, 1997).

Apart from their conservation value, marine reserves can provide important educational, recreational, and economic opportunities, *e.g.* tourism, (Agardy, 1994; Ballantine, 1991; Gubbay, 1995; Kenchington and Bleakley, 1994). Thus marine protected areas have a broad range of potential uses and can be established to realize many different conservation objectives.

The value and urgent need to establish MPAs in both the coastal and offshore (beyond 12 nautical miles) environments are well documented. A large body of literature has developed on MPAs, their use, effectiveness, and potential (see Carr and Reed, 1993; Roberts and Polunin, 1991; Rowley, 1992). There is considerable empirical evidence that marine reserves have contributed to higher diversity, higher abundance, larger-sized organisms, and even wholly different community structures. The degree of impact of MPAs, however, is not always clear (Allison *et al.*, 1998). While the degree of reserve effectiveness may be difficult to monitor and measure, this does not diminish the rationale or need for their establishment. Indeed many believe harvest refugia and biodiversity reserves are the only buffer we have against further deterioration of the marine ecosystem due to management errors, recruitment failure, overexploitation and continual habitat degradation of target and non-target species, accidents, and unfavourable environmental changes (Hutchings, 1995; Norse, 1993; Walters and Maguire, 1996).

It is for these reasons that MPAs are seen as essential to marine conservation and are provided for in the Convention on the Law of the Sea (United Nations, 1982), the Convention on Biological Diversity (United Nations, 1992) and the accompanying Jakarta Mandate (Conference of the Parties to the Convention on Biological Diversity, 1995), the Global Program of Action (UNEP, 1995), the Convention on Straddling and Migratory Fish Stocks (United Nations, 1995), MARPOL 73/78 (United Nations, 1973; 1978) and more recent IMO Guidelines (IMO, 1991), the World Heritage Convention (United Nations, 1972) and many others discussed further below. The number and success of MPAs established under these international instruments will depend on the commitment and ability of coastal States to meet their international obligations.

Defining Marine Protected Areas

In 1988, the World Conservation Union (IUCN) General Assembly adopted a resolution and policy statement on the role of MPAs in the protection and sustainable utilization of the marine environment (Resolution GA 17.38 of the 17th General Assembly of IUCN, San Jose, Costa Rica, February, 1988). This resolution recognized that the marine environment must be managed in an integrated manner if it is to sustain human use without progressive degradation. The resolution identifies the primary goal of marine conservation and management as follows:

> To provide for the protection, restoration, wise use, understanding and enjoyment of the marine heritage of the world in perpetuity through the creation of a global, representative system of marine protected areas and through the management in accordance with the principles of the World Conservation Strategy of human activities that use or affect the marine environment.

MPAs have been broadly defined by the IUCN as:

> Any area of intertidal or subtidal terrain, together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment.
>
> (Kelleher and Kenchington, 1991: 7)

In 1978, the IUCN identified ten categories of terrestrial and marine protected areas on the basis of primary objectives and management regime to serve a variety of purposes (following the most recent review, the list has been reduced to six). The categories include (Gubbay, 1995):

- strict protection area (Strict Nature Reserve/Wilderness Area);
- ecosystem conservation and recreation (National Park);
- conservation of natural features (Natural Monument);
- conservation through active management (Habitat/Species Management Area);
- landscape/seascape conservation and recreation (Protected Landscape/Seascape); and,
- sustainable use of natural ecosystems (Managed Resource Protected Area).

These categories have been developed for descriptive purposes, to facilitate comparison of protected areas around the world and tabulation of different protected area types. They are not intended to be prescriptive, but nonetheless provide a useful starting point for developing broad goals for individual protected areas.

Thousands of MPAs have been established throughout the world since their inception in 1935. In practice, the term 'MPA' is broadly defined, used to describe a wide spectrum of designated marine habitats and regions, having different design features, varying conservation goals, and offering varying levels of protection (Ballantine, 1991; Kelleher *et al.*, 1995; McNeill, 1994; Salm and Clark, 1989; Zurbrigg, 1996). Because the purpose varies considerably across the six basic types, meaningful comparisons can be difficult since the extremes involve strict protection on the one hand and multiple use management on the other, with clusters or zones of differing degrees of protection.

Given that the definition of MPAs include such a broad spectrum of protection standards and conservation objectives, it is important that at the very minimum, a threshold standard or reference point is established for MPAs under the *Oceans Act* (Canada, 1996). Arguably, the entire EEZ may be viewed as a multiple purpose zone managed for sustainable use. MPAs are another management tool, designating spatial reserves within the EEZ for elevated conservation and protection.

There has been a proliferation of marine protected zones in recent years (marine sanctuaries, marine reserves, marine parks, marine wilderness areas, heritage sites, Areas To Be Avoided (ATBA), Particularly Sensitive Areas, Ecologically Sensitive Areas, *etc.*). Many of these marine protected zones have been defined in various international Conventions or Agreements. Zonal definitions vary as does the meaning of protection. Generally, reserves are spatially defined marine areas where most or all human activities are restricted and compliance with those restrictions is high. Two of the most common types of marine reserves are harvest refugia and biodiversity reserves. Both these categories of MPAs are envisaged under the *Oceans Act.*

Legal Framework For The Establishment Of MPAs

Maritime Zones

With the recent promulgation of the *Oceans Act* (Canada, 1996), Canada has declared its maritime zones out to 200 nautical miles. The definition of an MPA and the extent of control that Canada as a coastal State may assert in establishing and regulating protected areas depends largely on the location of the site and the classification of the sea area under CLOS (United Nations, 1982). CLOS is a comprehensive global legal framework governing ocean use and is considered the most significant international instrument dealing with the protection and preservation of the marine environment. This Convention identifies new classifications or categories of ocean space; the most important for this discussion on establishing offshore MPAs are the contiguous zone and the Exclusive Economic Zone (EEZ). International law recognizes varying degrees of coastal State jurisdiction, rights and responsibilities within each of these maritime zones.

Contiguous Zone

Canada declared a contiguous zone out to 24 n. miles under the *Oceans Act.* This is a zone just beyond or contiguous to the territorial sea of a coastal State (United Nations, 1982: article 33). This zone may not extend beyond 24 nmiles from the baselines from which the breadth of the territorial sea is measured. The coastal State may exercise control in this zone to prevent and punish for the infringement of its customs, fiscal, immigration or sanitary laws and regulations (article 33.1[a][b]). Prescriptive routing measures can be used to redirect shipping away from marine protected areas located here (WWF UK, 1996: 26; United Nations, 1982: article 211.1.). Shipwrecks found within this maritime area are also considered to fall within the coastal State's jurisdiction. Thus if a sunken vessel is of importance for its natural sanctuary value, it can be protected by DFO from domestic and foreign divers and entrepreneurs.

Exclusive Economic Zone (EEZ)

Under the *Oceans Act*, Canada established an Exclusive Economic Zone (EEZ). This zone extends seaward to a limit not exceeding 200 n. miles from the territorial sea baselines (United Nations, 1982: article 55, 57). Within the EEZ, Canada has the sovereign rights (not sovereignty) for the purpose of exploring, exploiting, conserving and managing both the living and non-living natural resources of the sea-bed, its subsoil and superjacent waters (i.e found in the water column) (article 56), and with regard to most other activities, for the economic exploitation and exploration of the zone. Canada can control all the activities of its nationals and all vessels registered in Canada within this zone. All other States enjoy the freedom of navigation and overflight (beyond the territorial sea), as well as the right to lay submarine cables and pipelines (article 58) and fish, where permitted by the coastal State (article 62).[2] Sovereign rights to the seabed provide the coastal State with authority to take measures to protect seafloor habitat, subject to these rights and duties of other States (article 56.2).

Coastal States' Duty to Protect the Environment *vs.* Freedom of Navigation

The main constraint to establishing an offshore MPA under international law is the freedom of navigation by foreign vessels. This freedom granted to foreign vessels is qualified by the coastal State's obligation to preserve and protect the marine environment. Canada, as a coastal State, can detain and institute proceedings against foreign vessels in the EEZ when there is clear, objective evidence of a violation of vessel-source pollution laws resulting in a discharge causing or threatening major damage (article 73.1). Canada can also establish special areas to prevent pollution and safety zones around offshore installations and structures to prevent navigational accidents within the EEZ (United Nations, 1992). Canada can also take those measures necessary to protect and preserve rare and fragile ecosystems, as well as the habitat of depleted, threatened or endangered species and other forms of marine life. Other protective measures may include navigational practices and discharges, but not vessel design, construction, manning or equipment. Amendments that entered into force January 1, 1997, permit IMO to approve mandatory routing schemes for all vessels in the EEZ at the request of governments (Kimball, 1996: Annex F).

Canada can establish and regulate MPAs (from the water surface, down through the water column into the sub-soil) in the EEZ, subject to the freedom of navigation and overflight. The constraints posed by these freedoms can be effectively removed or reduced by traffic rerouting, amending certification standards, seeking international designations for environmental protection (eg. Areas to be Avoided, Particularly Sensitive Ses Areas, Special Areas, World Heritage Sites, etc., described further below).

2. MARINE PROTECTED AREAS IN INTERNATIONAL LAW

Overview

The establishment of a global system of MPAs requires coordination and integrated coastal and marine management at the international, regional, national and local levels. The world community, largely under the auspices of the United Nations, has negotiated an international legal framework to support the efforts of coastal states in the establishment of a global network of MPAs. The availability of the key global mechanisms is summarized in Figure 1.

The Convention on Biological Diversity

The Convention on Biological Diversity (CBD) (United Nations, 1992) is a legally binding agreement which entered into force in 1994. More than 145 countries are Parties to this Convention, including Canada. The CBD is the first comprehensive, international agreement committing governments to protect the planet's biological resources. This Convention applies within the maritime jurisdictional zones (United Nations, 1992: article 22[2] [4]) established under CLOS. The CBD considerably strengthens CLOS in that it applies conservation and sustainable use obligations to marine resources throughout the EEZ. To date, Canada has formulated a national biodiversity strategy (Biodiversity Working Group, 1994)[1]. Annex I of the CBD also identifies ecosystems necessary to migratory and other species which have potentially important conservation values. These criteria may be of assistance to DFO in selecting protected marine species and areas.

Figure 1: MPAs Created Under International Agreements

Options	Definition	Zone	International Conventions	Potential Applications
Special Areas		EEZ	International Convention for the Prevention of Pollution From Ships 1973 MARPOL	Special Areas to be protected from ship pollution
ATBAs	Areas to be Avoided	EEZ	Resolution of the Assembly of the IMO (1991)	Site designation and restrictive measures dealing with ship routing
PSSAs	Particularly Sensitive Sea Areas	EEZ	Marine Environment Protection Committee of IMO (1991)	Site designation and measures including discharge standards, routing options, vessel traffic services and buffer zones
MPAs	Marine Protected Areas	Any	Convention on Biological Diversity and the Jakarta Mandate	Provides international framework of support for national networks of marine protected areas
Plans	Protection of Marine Habitat	Any	UN Straddling Stocks Agreement	Provides for plans to be adopted as necessary to ensure the protection of marine habitat as well as associated and dependent species.
Regions/Areas	Pollution control in regional seas, protected areas	Any	UNEP Regional Seas Conventions Agreements and Protocols, etc	Additional policies and measures to control dumping and waste management, including radioactive pollution, accidental or intentional discharge of pollution and wastes from land-based and offshore activities, transboundary movement and disposal of hazardous wastes, discharges from ships. Special areas and species protocols allow for controlling passage of ships, stopping and achoring (consistent with international law), fishing, hunting, capture of protected animals and harvesting of protected plants, protection of fauna and flora from introduction of foreign species.
Coastal and Marine Areas	Coastal watersheds, estuaries and their drainage area, critical habitat, specially protected marine/estuarine areas and small islands	IW / TS	1995 Global Programme of Action on Protection of the Marine Environment from Land-Based Activities	Provides that coastal states identify and rank problems of ecosystem health
Wetlands	Critical international wetlands for coastal and marine species	IW / TS	1971 Convention on Wetlands of International Importance (RAMSAR)	Designation of wetlands within national jurisdiction for inclusion on a List of Wetlands of International Importance. Parties to conserve and promote the wise use of wetlands on the list
Areas/Sites	Conserve and protect outstanding examples of the world's cultural and natural heritage	TS	1972 Convention Concerning the Protection of the World Cultural and Natural Heritage	Marine areas may be included as either natural and/or cultural heritage but it appears to be limited to sites within national territory (i.e. the territorial sea
Species	Protect species of fauna and flora	Any	1973 Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	Regulates trade in three categories of species: 1) species threatened with extinction affected by trade, 2) species that may become threatened with extinction unless trade regulated, 3) species identified as regulated within national jurisdiction and requiring assistance of neighbouring jurisdictions
Species	Promote research and conservation measures	Any	1979 Convention on the Conservation of Migratory Species of Wild Animals	Applies to migratory species that are in danger of extinction throughout all or a significant portion of their range and migratory species which have an unfavourable conservation status. Includes migratory mammals and seabirds
Areas	Biosphere Reserves	Any	Biosphere Reserves Network (UNESCO's Man in the Biosphere Programme)	Biosphere reserves emphasize the role of humans in the protection and wise use representative natural area. May include highly protected core areas surrounded by buffer zones of multiple use. Particularly suited to coastal and marine areas

© Meltzer Research and Consulting

Note:

1. The requirement for IMO approval of shipping restrictions in the EEZ does not apply in hazardous ice covered areas.

2. No IMO approval for NWAs outside the Territorial Sea is required where there is no necessity to control shipping routes.

The Jakarta Mandate

In November 1995, the Parties to the CBD agreed to a program of action for implementing the Convention with respect to coastal and marine biodiversity conservation and protection: the *Jakarta Mandate on Marine and Coastal Biological Diversity* (Conference of the Parties to the Convention on Biological Diversity, 1995). Action Item 2 deals with the establishment and maintenance of MPAs for conservation and sustainable use of biological resources; and outlines a series of obligations and recommended actions. These actions are:

- establish or consolidate representative systems of marine and coastal protected areas, and enhance linkages and information exchanges among the sites;
- introduce conservation measures related to MPAs emphasizing the protection of ecosystem functioning, in addition to protecting specific species;
- incorporate MPAs within a broader framework for multipie use planning (eg. UNESCO's Biosphere Reserves);
- establish research and monitoring programs to assist with and evaluate progress;
- apply, where appropriate, rapid assessment techniques to identify and improve the management of MPAs;
- consider critical habitats of living marine resources as an important criterion for the selection of MPAs within the framework of integrated area management (IAM); and,
- DFO can find, under this agreement, considerable international support and garner global political will for the establishment of MPAs to conserve and protect the marine environment beyond the territorial sea.

UN Agreement on Straddling Fish Stocks

The UN Agreement on Straddling Fish Stocks and Highly Migratory Fish Stocks (United Nations, 1995; Kimball, 1996)[4] builds upon the provisions of CLOS concerning fish species that move between EEZs and the high seas or migrate over long distances in the high seas. This Agreement was signed by more than 40 nations in 1995 and will enter into force following ratification by 30 countries.

While the effect of most of provisions of the Straddling Stocks Agreement are more pronounced on the high seas, its general objective to ensure the 'long-term conservation and sustainable use' of the target straddling or highly migratory species as well as the 'associated and dependent species' within the EEZ. The Agreement specifically calls for the protection of habitats of special concern both within EEZs and on the adjacent high seas. The Agreement's emphasis on ecosystems, including associated or dependent species and habitats of special concern, make it an important international instrument for DFO to consider in selecting and establishing sites out to 200 miles, particularly those near the NAFO Convention area.

MARPOL 73/78

The Marine Environment Protection Committee (MEPC)[5] of the IMO has worked since 1978 to define areas requiring special protection from maritime activities due to their sensitivity with regard to renewable natural resources or scientific significance. Under MARPOL 73/78 there are Special Areas (IUCN, 1995: 3) and most recently the MEPC has created two new categories called Areas to be Avoided (ATBAs) (Kimball, 1996: Annex F) and Particularly Sensitive Sea Areas (PSSAs) (Gubbay, 1995: 39). These are three very important tools for DFO to consider in supporting its efforts to establish MPAs in the EEZ. As lead agency, DFO may wish to coordinate national requirements with CWS and Parks Canada, prior to approaching IMO.

Special Areas

The standards for prevention, reduction and control of vessel-source pollution are more stringent in designated special areas than in other sea areas. A special area is allowed under three Annexes where more stringent discharge restrictions are required. The definition of special area under the three Annexes is uniform and quite broad; Annex I (oil pollution) defines it as a "sea area where for recognized technical reasons in relation to its oceanographical and ecological condition and to the particular character of its traffic the adoption of special mandatory methods for the prevention of sea pollution by oil is required" (MARPOL 73/78 in Graham *et al.*, 1992: 371). Similar definitions are found in Annex II concerning noxious liquid substances in bulk and Annex V[6] dealing with garbage. In some cases, zero tolerance zones are established (Gaston, 1996: 22).

In 1991, IMO created Guidelines for the Designation of Special Areas (IMO, 1991) to elaborate criteria for designation. A coastal State's application to IMO is strengthened if discharges pose a threat to amenities; if the proponent is taking, or intends to take, measures to prevent, reduce and control pollution from sources other than shipping that contribute to stress in the area; and if there is an active regime to manage the area's resources.

Particularly Sensitive Sea Areas

Particularly Sensitive Sea Areas (PSSAs) (Gubbay, 1995: 39; Gjerde and Pullen, 1997) is the most recent category created by IMO requiring special protection from maritime activities due to their sensitivity to renewable natural resources, or scientific significance. The Marine Environment Protection Committee (MEPC) defined such areas and elaborated criteria for their identification in the 1991 Guidelines (IMO, 1991).

PSSAs are marine areas that require special protection because of their vulnerability to environmental damage by maritime activities. Accordingly, Agenda 21 has recognized PSSAs, calling on states to assess the state of pollution, and "to implement applicable measures, where necessary, within such areas to ensure compliance with generally accepted international regulations" (UNCED, 1992b: 17.30). A PPSA must qualify in *any one of* three categories which include ecological characteristics, social-cultural-economic, and scientific-educational values (IUCN, 1995: 3). Approved IMO measures in PSSAs include discharge standards, routing options, vessel traffic services and buffer zones (IUCN, 1995: 3). This concept is useful in mitigating the operational and accidental pollution discharges from ships as well as physical damage due to shipping (grounding, destruction or smothering of habitats). While some think this designation may be more appropriate for small, critical areas (Kimball, 1996: 32), the Great Barrier Reef is the first area to be designated as a PSSA.

The Wadden Sea and the waters around the Galapagos Islands have also been proposed (Kelleher *et al.*, 1995: Vol. 1, p.10).

Areas to be Avoided (ATBAs)

Amendments to the General Provisions for Ship Routing approved in 1995 entered into force January, 1997, permit IMO to designate Areas to be Avoided (ATBAs) for environmental and safety reasons (Kimball, 1996: Annex F). This designation is for certain sizes of ships. There are 21 ATBAs of which 12 (Kelleher *et al.*, 1995: Vol. 1, p.38) have been established for the environmental protection. These include, among others, the Great Barrier Reef (Capricornia section only); Shetland Islands; Nantucket Shoals; Northwest Hawaiian Islands; Bermuda; Mahe, Seychelles; Florida coast; Cape Terpeniya, Russia; and Grassholm Island, U.K.

Mandatory Ship Routing Schemes

Rules on mandatory ship reporting and Guidelines and Criteria for ship reporting systems were introduced in 1993 and 1994 (Kelleher *et al.*, 1995; Gubbay, 1995: 39). In effect as of January, 1997, the IMO can approve mandatory routing schemes and ship reporting beyond the territorial sea at the request of governments.

International Civil Aviation

The issue of designating superjacent areas in air space as environmental protected zones is one which the International Civil Aviation Organization (ICAO) must address. It is a new and unclear area of law that requires examination and innovation. Given that the routing over Canada's ocean space (including the territorial sea) is negotiated through ICAO, redirecting such air traffic should not be too difficult. Similarly, emission standards and other issues pertaining to air travel are regulated by ICAO. DFO, together with Parks Canada and CWS, would be well served to explore these issues with the program staff at ICAO headquarters in Montreal.

3. CANADIAN LEGAL FRAMEWORK FOR ESTABLISHING OFFSHORE MPAs

While international marine environmental law provides the global legal framework for the establishment of marine protected areas, the system of global governance relies on member States to fulfill their international obligations by enacting, implementing and enforcing national legislation. The process of designating and regulating an MPA depends on national legislation. Canada now has three legislative instruments to establish MPAs: the *Canada Wildlife Act* (Canada, 1995b), the *National Parks Act* (Canada, 1995a) and the *Oceans Act* (Canada, 1996). Please see Figure 2 comparing MPAs under these three laws.

DFO as the lead agency must coordinate and collaborate with these and other federal government departments to achieve a national network of MPAs. DFO should formally establish the MPA inter-departmental Steering Committee and give this institutional arrangement the authority to undertake the necessary coordination and develop a complimentary national system of protected areas out to 200 miles.

Parks Canada has had legislative authority for several years to establish MPAs; as a consequence they have a more fully developed MPA policy. The principle objective of the Parks MPA programme is to establish and protect a network of representative marine areas in each of Canada's 29 marine eco-regions. These sites will be relatively large areas having unique or special oceanographic, biological, or cultural features. The area must be healthy or can be restored through designation. These sites will be protected from most potentially damaging human activities. Many fisheries, if prosecuted responsibly in accordance with the precautionary approach and sustainable development principles, will continue in these sites. The *Oceans Act* and the *National Parks Act* are complementary.

Figure 2: Marine Protected Areas Established Under the *Canada Wildlife Act*, *Oceans Act*, and *National Parks Act*

	Canada Wildlife Act	***Oceans Act***	***National Parks Act***
Designation	National Wildlife Areas and Marine Wildlife Areas	Marine Protected Areas	National Marine Conservation Areas, formerly known as national marine parks
Jurisdiction	Internal waters, territorial sea, EEZ. Coastal or offshore.	Internal waters, territorial sea, EEZ. Coastal or offshore.	Internal waters, territorial sea, EEZ Coastal or offshore. Includes sea bed, subsoil and the overlying water column (Parks Canada, 1995)
Lead Agency	DOE (CWS)	DFO	Parks Canada
Objectives	To protect nationally significant habitats, especially for migratory birds, but also for other wildlife, for the purpose of wildlife research, conservation and interpretation. Protect wildlife and habitats by prohibiting human activities that are harmful to species and the environment.	To conserve and protect fishery resources (including marine mammals), endangered or threatened marine species, unique habitats, marine areas of high biodiversity or biological productivity, or any other marine resource or habitat necessary to fulfill the Minister's mandate (eg. scientific research). Develop a network of MPAs complementary to those of PC and Env. Can, and reflects the diversity of the oceans.	To conserve representative examples of Canada's marine environments, coastal zone and Great Lakes from 29 marine natural regions. To provide opportunities for public understanding, appreciation and enjoyment of Canada's natural and cultural marine heritage.
Area Evaluation Method	Surveys and other information sources are used to identify areas of importance to migratory birds. Candidate sites are put on a priority sites list. Feasibility determined through consultations.	Nominations by interested groups, regional overviews (for systematic approach), identification of candidate sites, MPA proposals, area identification list, area evaluation and selection, pilot MPAs.	System planning with 29 marine natural regions, identification of representative marine areas, feasibility studies.
Site Selection Criteria	Importance to migratory birds, rare and endangered species and unique associations of species; and unique habitat types. Opportunity, urgency and feasibility also considered.	Developing national guidelines. Objectives listed above from s. 35. Plus, social and economic values, immediacy of need, practicality, partnership opportunities, community support, adequacy of existing regulatory regimes, potential human activity threats, ecological fragility, feasibility of enforcement, scientific importance, educational value, fiscal constraints, and regional, national, or international significance.	Naturalness, representativeness (geological, oceanographic, biological and ecosystem diversity), and factors listed in NMCA Policy (1.2.2)

Information-Gathering and Management	Ongoing marine bird surveys, research and monitoring, including internationally shared species. Seabird registries maintained for regions.	Present information, ongoing research and traditional ecological information. Developing broad information base on MPAs, existing and planned uses, environmental data, and ecological information. Common database using GIS for storing and interpreting information. Team of information specialists.	Biophysical resource inventories, public consultation, research and monitoring programs.

© Meltzer Research and Consulting

	Canada Wildlife Act	***Oceans Act***	***National Parks Act***
Stakeholder Consultations	Consultations carried out with provincial and municipal governments, First Nations, local groups and individuals. Consultation expected at proposal/establishment stage, management plan, development and review.	Minister may consult with other federal or provincial ministers, boards and agencies, aboriginal groups, and coastal communities (s.33(2)).	Public consultation at establishment stage, management plan review, regulation development
Area Establishment	Regulation	Regulation	NMCA Agreements with federal and provincial governments, and aboriginal organizations. Schedule or amendment to Act. New legislation (c 29) proposes Order-in-Council, with parliamentry overseeing process
Area Modification	Regulation	Regulation	Requries act of Parliament
Multi-sector Partnerships	Agreements with provincial/territorial governments, First Nations, or other organizations or individuals (s.5, 7). Partnership agreements may be developed for area establishment phase; cooperative management of the area; and for programs for wildlife research, conservation and interpretation.	Minister shall cooperate with other federal or provincial ministers, boards and agencies, aboriginal groups, and coastal communities (s.33(1)). Partnerships with wide variety of stakeholders including: coastal communities, fishing industry, aquaculturalists, aboriginal organizations, conservationists, ocean industries, and federal, provincial and municipal governments.	Partnerships with DFO managing fisheries, and Transport Canada and DFO/Coast Guard managing marine transportation and navigation issues Management advisory committees established for each site (mandatory under section 2.7 of Policy)
Management Measures	Conservation measures set out in management plans; most human activities prohibited in the regulations but can be permitted through a flexible permitting system, if compatible with conservation.	Zoning, prohibition of classes of activities, temporal and spatial closures, management plans, buffer areas, integrated management, ecosystem approach.	Zoning, management plans (required within 5 years by s. 5(1.1) of Act)
Level of Protection	Broad prohibitions in regulations against most human activities. Some activities may be permitted if compatible with conservation. Several types of permits require CEAA assessments.	Interim protection and protection in emergency situations available (s 36). Level of protection can vary from strict 'no take' zone where access limited to areas where controlled use or resource harvesting is allowed.	Interim protection available for proposed sites, although not provided for in Act. Highly protected zones: seabed mining, oil and gas exploration and extraction, and ocean dumping prohibited. Hunting permitted (NMCA Policy) Buffered by cooperatively managed multiple use areas: commercial shipping, commercial and recreational fishing and hunting permitted Pollution prevention provision (s. 8(1.4))

Co-management	Co-management possible through agreements e.g. with provincial and territorial governments; other federal government departments; aboriginal groups according to terms of land claim agreement (eg, Nirjutiqavvik NWA)	Minister shall cooperate with affected aboriginal organizations (s. 33(1)).	Co-management with aboriginal organizations according to terms of land claim agreement.

© Meltzer Research and Consulting

	Canada Wildlife Act	*Oceans Act*	*National Parks Act*
Community Involvement	Consultations with communities for new sites proposals, management planning and review.	Minister shall cooperate with coastal communities (s. 33(1)). Nomination of areas by interested groups.	Consultations with communities during park establishment, management planning and review (management advisory committees)
Research Requirements	Research is one purpose for which areas may be established. Aimed at wildlife ecology and monitoring, habitat restoration and management, wildlife-habitat relationships.	Limited understanding of marine ecosystems dynamics. Require data for understanding oceans, their living resources and hydrographic, oceanographic, fisheries, and other marine systems.	Similar to CWA, except that research is not a purpose for which areas are protected, once established, research becomes central to management, with results extrapolated to other areas
Legal Mechanisms	Regulations prescribing measures for the conservation of wildlife (s. 12); prohibitions, permits.	Regulations prescribing zoning, prohibition of activities.	Interim protection under *National Parks Act* and Regulations More specific NMCA legislation being drafted
Monitoring	Ongoing marine bird surveys and monitoring programs, management plan review every 5-10 years	Monitoring programs, monitoring environmental parameters, refining management plans.	Management plan review every 5 years (s. 5(1.3) of Act) Report to Parliament on state of the parks due every 2 years (s. 5(1.5) of Act)
Enforcement (Penalties)	Fines up to $100,000 for an individual plus 6 months jail, and up to $250,000 for a corporation, plus 5 years jail (s. 13(1)). Fines cumulatively imposed for each animal, plant or organism affected by offence (s. 13(4)). Other flexible remedies available such as community service, remedying harm, or paying cost of remedial action (s. 16)	Fines up to $100,000 (summary conviction) or $500,000 (indictable offence). Fines cumulatively imposed for each animal, plant or organism affected by offence (s. 39.6(4)). Other flexible remedies available such as community service, remedying harm, or paying cost of remedial action (s. 39(9)).	Fines for contravening Act or regulations up to $2,000, except for poaching of listed threatened species including Piping Plover, Whooping Crane, Peregrine Falcon and Polar Bear (up to $10,000, plus 6 months imprisonment) or listed protected species including Atlantic Salmon (up to $150,000, plus 6 months imprisonment) New legislation proposes penalties identical to *Oceans Act*
Public Education or Constituency Building	Interpretation and public awareness programs.	Establishing a public information and education program using wide range of environmental tools.	Interpretation and public education programs.
Socio-economic Benefits	Conservation, marine research, interpretation, protection of economically important species, biodiversity conservation, ecotourism.	Conservation, marine research, protection of economically important species.	Tourism, conservation, interpretation, education, marine research and ecological monitoring, protection of economically important species
Funding	Cost-sharing for conservation programs possible through s.5,6,7 agreements; generally no access fees (except, for example, Cap Tourmente which is set in regulations); volunteer workers essential to public awareness programs at some areas		A new act before the house (Bill c.29) introduces a number of innovative funding approaches to facilitate the establishment of new parks.

© Meltzer Research and Consulting

The Canada Wildlife Act (CWA) was amended in 1994 to allow for the establishment of Marine Wildlife Areas out to 200 nautical miles to protect marine wildlife and their habitats. As fish are also wildlife there is a potential for overlap, similarly with habitat and ecosystem protection. The Canadian Wildlife Service (CWS) has had the legislative mandate for conservation and management of seabirds and waterfowl for many years. They are well respected and have developed a reputation for careful and successful stewardship. CWS is not interested in conserving and managing fish directly; however, fisheries are a concern to the extent that fish are a main ingredient in the food chain for many of these birds. It is this ecosystem interdependence and interrelationship that is of interest to CWS. Depending on the species or ecosystem, areas established to protect seabirds or other wildlife under the CWA may or may not necessitate restricting fishing. In responding to its international obligations under the Convention on Biological Diversity (United Nations, 1992), perhaps CWS will extend its focus beyond birds and protect marine flora and other wildlife not covered by DFO under the *Oceans Act*. DFO and CWS need to discuss their respective responsibilities in designing and implementing a national MPA system which will conserve, sustain, and protect marine biodiversity.

DFO, as the lead agency, must ensure that an integrated approach is adopted for the establishment, management, monitoring and review of all MPAs. Research should be shared wherever possible. Monitoring and enforcement programmes should be integrated and coordinated to compare findings, as well as increase effectiveness and efficiency. Canada has a significant body of federal and provincial legislation that can support the establishment, management, control and monitoring of MPAs under all three MPA legislative instruments. Wherever possible, existing legislation should be used to complement and reinforce the provisions of the proposed MPA regulatory framework under the *Oceans Act*.

4. GENERAL PRINCIPLES FOR ESTABLISHING OFFSHORE MPAs

Importance of the Environment

Over the last two decades, there has been growing awareness, nationally and internationally, of the importance of the environment. As well there has been a growing awareness of the impact of human activities on terrestrial, atmospheric and marine ecosystems. With environmental degradation and the rapid depletion and extinction of natural resources, new philosophies, policies, principles and laws have developed to protect and sustain the ecosystem for present and future generations. Central to this global environmental framework are the principles of environmental security, sustainable development, integrated management, and precaution.

Environmental Security

It is generally accepted that the concept of security has broadened to encompass not only military and economic dimensions but also environmental security. Environmental security protects a wide range of human interests, including health, food, habitat, economics, etc. (Borgese, 1996). The ocean occupies over 70 % of the Earth's surface; and "man's fingerprint is found everywhere in the ocean" (GESAMP, 1990). Coastal and marine areas throughout the world are under stress. There are six main anthropogenic factors causing marine environmental degradation and depletion of living marine resources. These are: population growth, pollution, habitat degradation and destruction, multiple resource use conflicts, over-exploitation of resources, and global climate change (Norse, 1993).

Ensuring the health of the marine environment and its resources, in the face of expanded uses/abuses and technological advances, is vital for human survival. Human activities affecting coastal and ocean space pose a growing global risk to all life. To achieve environmental security, states must conserve and protect the marine environment and its natural resources. The international community, through the United Nations and its agencies, and coastal States have introduced a variety of principles, policies and programs to rehabilitate the marine environment and manage the EEZ sustainably.

Sustainable Development

General Issues

Sustainable development, an international concept guiding conservation and management decisions, is a guiding principle of the *Oceans Act* (Canada, 1996). This principle was internationally endorsed following the release of the 1987 World Commission on Environment and Development Report *Our Common Future* (WCED, 1987). The report concluded that the current trends of economic development and accompanying environmental degradation are unsustainable. The Commission unanimously agreed that the global environment is important for everyone's future and immediate changes were necessary for the survival of much of the world's human population and many other species. The need to achieve a balance between economic development and environmental health led to a reconsideration of common property and the introduction of the concepts of sustainable development and sustainability.

Sustainable development improves the quality of human life while living within the carrying capacity of the supporting ecosystems; the needs of the present are met without compromising the ability of future generations to meet their own needs. Sustainable development is a dynamic, multi-stakeholder process that promotes equity, both intragenerational and intergenerational. Sustainable development should satisfy the multiple criteria of sustainable growth, poverty alleviation as well as sound conservation and management. While considered a contemporary paradigm, this concept is a well established principle in many indigenous cultures. Expressed by the Mi'kmaq, sustainable development is the equivalent of using the natural bounty provided by the Creator for the self support and well being of the individual and the Nation without jeopardizing the integrity, diversity or productivity of the environment (Native Council of Nova Scotia, 1993).

The challenge confronting industrialized countries and developing countries alike is how to achieve sustainable development: what policies and decisions will protect the environment while allowing economic growth? What standards of environmental health and quality of lifestyle are desired? What is the vision for a sustainable future? What institutional changes are necessary? These are important policy and planning issues. The UN Human Development Report emphasizes that quality of life and development cannot be accurately described in economic terms alone. The 1991 Report states, "It is wrong to suggest that economic growth is unnecessary for human development. No sustained improvement in human well-being is possible without growth. But it is even more wrong to suggest that high economic growth rates will automatically translate into higher levels of human development" (UNEP, 1991).[8] Ultimately, no activity is sustainable unless the environment is conserved or protected.

Economic Benefits of Environmental Protection

Both centrally planned economies and free market oriented governments have traditionally bestowed little value on the natural environment. Both approaches have contributed to declines in potentially renewable resources and environmental health. Sustainable development introduces a new international environmental and conservation ethic assigning value to the natural environment.

Decisions concerning use of the environment and natural resources are often difficult and the preferred course of action is not always clear, given the externalities, uncertainties and differing political ideologies. Cost benefit analysis is an analytical tool often used by decision makers to determine the preferred course of action. Assigning value to the environment has caused a corresponding shift in economic thinking. Environmental economists, together with other disciplines, are developing new theories, models and techniques to deal with conservation values and marine conservation practices, including multiple and restricted uses of marine areas (Farrow, 1996).

A well established concept in natural resource economics is Total Economic Value (TEV). Total economic value has three components: use value, option value, and existence value. Existence Value ("Pearce *et al.*, 1989), or Passive Use Value (Farrow, 1996) is ascribed to a wilderness area or to a species simply by virtue of its presence and continued existence. This method is used by individuals and society to attribute value to marine areas they never plan to see or use but wish to preserve and protect by establishing MPAs, such as the Great Barrier Reef, the Florida Keys, Stellwagen Bank and similar areas. Reducing the probability of extinction of an endangered species and expanding species diversity are also existence benefits.

Existence value, while often significant, is difficult to quantify. What value should an economist assign to preserving each species or reducing the probability of its extinction? What value does a protected marine area have? Environmental economists have designed different models to estimate such passive uses, many of which are considered public goods (Mitchell and Carson 1989; Hausman, 1993). These values are then compared to the costs associated with effort and access management, including the establishment of a reserve or refuge.

MPAs not only have existence value but also use and option value. Use value arises from any net contribution made to resource abundance generated from a refuge or reserve (*i.e.* increased fish catches outside the reserve) or any benefits generated from non-consumptive or passive uses such as research, education, recreation or tourism.

Option value arises by keeping opportunities available for present and future generations. Damages to the marine ecosystem are often estimated and measured as lost benefits in benefit-cost analysis. Another aspect of option value is the uniqueness of the asset (species, ecosystem, gene) potentially damaged or protected (Farrow, 1996). Thus, MPAs are an essential part of the sustainable development equation, both from an environmental protection as well as an economic development perspective.

Integrated Ocean Management

Integrated ocean management is another principle cited in Agenda 21 (UNCED, 1992b) and the *Oceans Act* (Canada, 1996) to govern ocean use. The idea of integrated management of sea uses is relatively new. In many ways it is a result of extension of maritime jurisdiction after a 200 nautical mile Exclusive Fishery Zone was declared in 1977, industrialization of the seas, expanded uses, limitations of sectoral management, and recent awareness of the global risk to life posed by human activities. Sectoral approaches, while administratively and commercially convenient, are limited; sectoral management does not deal with interrelationships among individual uses nor the related environmental impacts. Fragmented sectoral sea use planning and management, fraught with intra and inter-sectoral conflict, has contributed to resource depletion and habitat degradation.

Integrated ocean management has slowly developed since the conclusion of the 1982 Law of the Sea Convention (LOSC) as a fundamental principle to govern and manage human activities in the EEZ. The opening words of the 1982 Convention recognizes that: "the problems and opportunities of ocean space are closely inter-related and need to be considered as a whole" (United Nations, 1982). In 1987 the UN Secretary-General called for all coastal States to implement the Convention and develop "a national [ocean] policy that establishes goals, objectives and priorities and lays down basic principles and criteria which provide guidance for the formulation of plans and programmes and a marine development strategy" (United Nations, 1987). That same year the Report of the World Commission on Environment and Development (WCED, 1987) focused on the inadequacies of sectoral sea use management. The Report emphasized the need for integrated sea use planning and management linking offshore living resources to the coastal ecosystem.

Integrated sustainable management, envisaged in Agenda 21, is a complex process that endeavours to improve on and supplement sectoral management. Couper (1992) describes integrated ocean management as "a methodology through which several activities (shipping, navigation, fishing, mariculture, sea-bed mining for minerals and anaerobic organisms, oil and gas production, military, tourism, recreation, waste disposal, salvage, research, etc.) and environmental quality in a sea area are considered as a whole, and their uses optimized in order to maximize net benefits to a nation, but without prejudicing local socio-economic interests or jeopardizing benefits to future generations". Integrated ocean management includes comprehensiveness of scope, coherence of its elements, consistency over time, and cost-effectiveness of its results (Peet, 1992). An effort must be made to integrate the whole system: the ecosystem; sectors; disciplines; departments; governments; nations. This is a tall order, and the concept is still developing.

A practical, institutional arrangement has to be found to achieve integrated ocean management. At a local, regional and national level, Canada can begin to introduce these concepts through national ocean policies and strategies envisaged under the *Oceans Act*. A mechanism to synchronize the efforts of different stakeholders through the development of a collaborative, shared vision, strategy and action plan for the sustainable use and management of ocean space and resources, is a practical place to start. The creation of offshore MPAs is but another spatial and temporal use of the sea regulating human access to the resource within the context of integrated planning and management.

The Precautionary Approach

Legal Issues

Legal and scientific development of the precautionary principle/approach over the last twenty years has considerably revised marine environmental policy. The 1992 Rio Declaration (UNCED, 1992a) and the Bergen Declaration (Economic Commission of Europe, 1990) laid the foundation for the subsequent application of the principle/approach to protecting and sustaining fish and other marine wildlife. With the recent adoption of the 1995 UN Straddling Stocks Agreement (United Nations, 1995), the 1995 FAO Code of Conduct for Responsible Fisheries (FAO, 1995), and the 1996 *Oceans Act* (Canada, 1996), the precautionary approach is now applicable to fisheries conservation and management. The precautionary approach is a critical paradigm shift in fisheries management. albeit one still being developed by scientists and social scientists alike.

Conservation (in the conservation ecology terminology) means using natural resources wisely. To use marine resources 'wisely' in the post-UNCED world also means to use resources 'cautiously', taking preventive measures to safeguard the environment. The concept of precaution, or the precautionary approach, requires decision makers and managers to err on the side of caution when information on the potential impact of human activity or status of the resource is limited or uncertain. Precautionary action dictates that preventive, anticipatory, pre-emptive, and corrective conservation measures be taken at all times as scientific evidence is often fraught with uncertainty and risk.

There are still many issues associated with the interpretation and practical implementation of this approach which need clarification:

- the fundamental principles of precautionary action;
- the implications of adopting this approach for scientists, decision-makers, and resource-users;
- the scientific and legal interpretation of the approach to effect improved marine environmental protection and fisheries conservation, rather than one designed to maintain the status quo;
- the role of science in giving practical effect to the concept of precaution; and,
- the implications of the shift in the burden of proof for decision-makers and stakeholders.

The following discussion will attempt to clarify the concept that is central in many ways to the establishment of MPAs and provide some guidance for decision makers and other stakeholders.

Beyond Freedom of the Seas

The traditional order of the oceans is governed by the 17th century notion of freedom of the seas, on the premise that marine resources were inexhaustible. Accordingly, humans were free to fish and navigate throughout ocean space as long as they caused no harm. Over the years, the adverse impact to the marine environment from human activity became evident and problematic. But scientific proof was required to show that the activity was harmful before conservation action could be taken to restrict the stakeholders freedom to fish or to navigate. Evolving international law has considerably qualified these freedoms, imposing controls on human activities through various international agreements. Through the adoption of the precautionary approach, marine resource management is moving from a 'wait and see' approach to an 'better safe than sorry' strategy. These policy shifts have profound implications for decision makers, managers, scientists, user groups and other interested parties.

Conventional Resource Management: The Wait and See Approach

The role of science has been very important in marine resource management. Decisions on ocean dumping assume that the ocean can assimilate a *definable* amount of deleterious material before causing harm. Similarly, conventional fisheries management decisions are made on the assumption that a *quantifiable* amount of fish can be repeatedly removed from the sea on a sustainable basis, without adversely affecting the resource or the marine ecosystem. Modern resource management is rooted in the assumption that it is scientifically possible to accurately determine how much of any substance can harmlessly enter the marine environment, and how much fish can be caught to ensure a sustainable fishery.

Based on this accurate and timely scientific information, conventional management regimes require scientific proof that harm will occur before substances are prohibited or a fish quota reduced. Corrective conservation measures await final scientific analysis. It is a reactive, remedial management strategy: a 'wait and see' approach.

Under this regime, those who perceive harm also have the burden of proof to demonstrate that the management decision jeopardizes the health of the marine environment. Such proof, however, is not only costly, but is also difficult and sometimes impossible to obtain. As a result, fisheries management has typically permitted fishing everywhere, all or most of the time, until there is conclusive proof that the level of effort or method of fishing is having a negative impact on the stocks (Ballantine, 1995; Roberts, 1997).

The history of fisheries management policy shows that the 'wait and see' approach has led to the present declining state of the world's fisheries (Norse, 1993). While waiting for evidence of potential harm, imminent threat or damage, fishery resources have collapsed. As a result, the largest and more commercially valuable species have been over-fished, followed progressively by the depletion of less commercially valuable species (Norse, 1993). Each stock is in turn pushed towards extinction (FAO, 1995). By waiting for irrefutable scientific evidence, the resource has reached a perilous state or has collapsed before decision makers and managers take conservation measures. Fisheries operations have remained commercially viable long after the fishery was in trouble. Where a fleet is subsidized, as most are in the world, a fishery could remain profitable even when the resource was depleted.

Failure of Conventional Fisheries Management: inherent uncertainty, error bars and risk

Regulatory frameworks based on the 'wait and see' approach do not adequately account for "ecological complexity" (Roberts, 1997) nor high levels of natural variability from year to year and place to place. Much is unknown about the marine ecosystem: how species interrelate, how environmental factors affect the flora and fauna, etc. Much is unknown about the behaviour, growth, reproduction, diet, etc. of marine wildlife. For most commercial species, given the number of unknowns, it is difficult to accurately estimate current population size, let alone forecast future abundance.

Over the last twenty years, fisheries management theories have shifted from single-species models of maximum or optimal sustainable yield, to searching for complex, multi-species approaches to achieve sustainable ecosystem management. Accordingly, fisheries stock assessment is not a precise science and is still considered a relatively new discipline, fraught with uncertainty. Stock size is typically based on models using information gained from previous years' surveys and catch statistics. Obtaining accurate and timely data is expensive and difficult. Survey abundance indices are often highly uncertain (Walters and Maguire, 1996) and catch per unit effort statistics are often unreliable due to misreporting, dumping and discarding. And with shrinking research budgets, scientists and decision makers will have to increasingly rely on commercial catch statistics.

While decisions are based on the best available scientific evidence, this information has wide error bars. The inherent uncertainties and associated management risks are often not appreciated by decision makers nor fishing interests. Contesting a policy or management decision on the basis of risk to the environment is difficult. The burden of proof is on the interested party claiming potential or actual harm to show the decision is not in keeping with sustainable development. Such proof is costly and difficult, if not impossible, to obtain. Decisions therefore favour human activity in the absence of conclusive proof that the environment is at risk. (The paradox is that no matter who has the burden of proof, the probative value of the information is questionable).

Decision makers are under constant pressure to maximize allocations, increase licences and extend the fishing season. Given the risks to the environment, fisheries management becomes a game of risk management or 'Russian Roullette'. Under the 'wait and see' approach, there is little room for management error, imprecise gear, and non-compliance with conservation and management measures. Measures to safeguard the resource are often taken only after the damage has occurred. As a result, conventional management has most often failed to protect the marine environment and resources from serious degradation and depletion.

Need for a New Paradigm: The Precautionary Approach

Fisheries management, even in the most advanced countries, has suffered many failures. Direct losses of fishery species vulnerable to overexploitation are increasingly being reported with widespread local extinctions (Roberts, 1997; Dayton *et al.*, 1995). While exploited apex predators are considered particularly at risk (Norse, 1993; Roberts, 1997), non-target associated and dependent species are also at risk (see FAO, 1993; FAO, 1994; Norse 1993; Pauly and Christensen, 1995; FRCC, 1997). In Canada, fisheries science, fisheries management, politicians and the fishing industry have come under attack. The 1992 groundfish moratorium remains a bitter pill. While acknowledging the difficulty and imprecision in calculating stock assessments and forecasting abundance, the collapse of the northern cod was inconceivable to most stakeholders. Even so, it could happen again, and again and again. Walters and Maguire (1996) argue that systematic overestimation of stock size and inadequate attention to the risk of recruitment overfishing of the 'wait and see' approach will continue to lead to management failures and stock collapses. Reliance on the precautionary approach appears to be the common sense alternative (Borgese, 1996).

Underlying the precautionary approach is the dual recognition that all human activities can potentially adversely impact the marine environment, and that there are severe limitations on science to protect the marine environment given the general lack of timely, accurate and adequate information necessary to make decisions. International recognition of the impact of human activities on the marine ecosystem and habitat led to the adoption of the concepts of prevention, anticipation and precaution in Agenda 21. However, the precautionary approach was excluded from the sections of Chapter 17 pertaining to fisheries management.

Following UNCED, there was a growing awareness of the impact of commercial fishing on target species, ecosystems and physical habitats throughout the world. Fisheries collapses, both within the EEZs of coastal States and on the high seas, resulted in public opprobrium. The 1995 UN Straddling Stocks Agreement (United Nations, 1995), the 1995 FAO Code of Conduct for Responsible Fishing (FAO, 1995), and the Jakarta Mandate (Conference of the Parties to the Convention on Biological Diversity, 1995) are three international responses to this global fisheries crisis. These international agreements apply the precautionary approach to the marine ecosystem, living marine resources, and the physical habitats.

Preventive, Cautious Use of Resources Given Uncertainty

The precautionary approach is generally defined as erring on the side of caution when information on the potential impact of human activity or status of the resource is limited or uncertain.[9] The FAO, in a report prepared for the UN Straddling Fish Stocks Conference, stated that the precautionary approach requires preventive or remedial action erring on the side of conservation when there is doubt about the effect of technology or fishing practices on the marine environment and resources (United Nations, 1994: 2):

> The concept of precaution requires management authorities to take pre-emptive action ...even in the absence of certainty about the impact of the causal relationships. When there is doubt about the effect of technology or fishing practice on the marine environment and resources, preventive or remedial action would have to be taken, erring on the safe side.

The UN Straddling Stocks Agreement (United Nations, 1995) sets precautionary reference points and provides for the conservation and protection of target, associated and dependent species and their habitats. The use of precautionary reference points is intended to contain harvesting within safe biological limits. Furthermore, coastal States are obliged to be more cautious when information is poor, and an absence of scientific information is not to be used as a reason for postponing or failing to take conservation or management measures.

The Jakarta Mandate (Conference of the Parties to the Convention on Biological Diversity, 1995) subscribes to the precautionary approach and identifies actions to conserve and protect biodiversity, including MPAs and ICZM. The *Oceans Act* defines the precautionary approach as "erring on the side of caution" (Canada, 1996: article 30[c]). The FRCC endorses the precautionary approach and in its March 1997 Report defined it as "fisheries conservation approaches that are prudent and holds that it should not be necessary to await final scientific analysis before taking conservation measures. It should be enough that on the balance of the evidence, it makes sense to take action; that is the Precautionary Approach" (FRCC, 1997: 3). Thus using marine resources 'wisely' (in the conservation ecology terminology) is increasingly interpreted to mean using resources 'cautiously' (in adopting the precautionary approach) and 'responsibly.

Pro-active, Responsible, Risk-averse Management

The precautionary approach not only calls for caution, it also calls for pre-emptive action. Rather than 'waiting to see' if the resource is adversely impacted, precautionary management calls for prudent, pro-active measures and preventive actions based on the available information. By failing to take such measures, the marine environment may be placed at risk either now or in the future. Thus, central to the precautionary approach is identifying and implementing preventive and risk-averse management strategies. The establishment of precautionary reference points and MPAs fall within this category.

Coastal and offshore MPAs can provide decision makers with some flexibility and through active adaptive management allow for underestimations in stock size.

Shifting the Burden of Proof

In a contested matter, the precautionary response shifts the burden of proof to the regulating authority and/or prospective user to demonstrate the activity is ***not*** likely to harm the environment or pose a threat to human health. Those wishing to use the ocean resource must prove that the marine environment is safeguarded. This evidentiary shift is consistent with risk-averse management.

With the reversal of the burden of proof, Canada can require distant water fishing nations (DWFSs) to prove that their level of fishing effort (actual or desired) for straddling stocks in the NAFO area is prudent and sustainable; and DWFNs under NAFO may require Canada to prove that domestic exploitation of straddling stocks within the EEZ is sustainable. Similarly, components of the domestic fishing industry, NGOs or other interested parties may dispute a policy or management decision on the grounds that it does not adequately protect the resource and/or the marine ecosystem. In such cases, the fishing industry, managers and decision makers could be required to prove that their actions are responsible, prudent and in keeping with the principle of sustainable development. Thus, while the burden of proof has shifted, the need for timely and accurate scientific and other information on the status of the resource and the marine ecosystem remains important.

Better Safe Than Sorry: What is an Acceptable Level of Harm?

Central to this discussion is determining the acceptable level of risk. If we are managing to achieve sustainable development, is there an acceptable threshold of harm? Do the existing or proposed human activities present a risk of 'serious or irreparable damage', 'significant loss', 'reasonable grounds for concern', or perhaps, no risk at all? What are the trade-offs? Should short-term socio-economic considerations temper conservation objectives? If so, to what extent and under what circumstances?

In its simplest form, the precautionary approach is a policy of 'better safe than sorry' to guide decision-makers. When making management decisions, DFO, other government departments, and stakeholders will continue to weigh the available scientific and other information regarding the reasonableness and environmental sustainability of the proposed human activity, against the available scientific and other information regarding the potential risks to the ecosystem from the proposed activity. Information provided to decision makers by both sides will continue to have fundamental probative problems. Decision makers will continue to operate under political pressures to respond to short-term socio-economic demands. By invoking the precautionary approach, the balance will be tipped in favour of the environment.

This weighting in decision-making is now generally considered by marine scientists, resource users, and environmentalists as not only imperative, but also socially responsible. The precautionary approach and MPAs are considered essential to avoid continued resource depletion, extirpation and extinction as well as habitat degradation and destruction. Sustainable development and protection of the marine ecosystem is inextricably tied to environmental and economic security. If the resource base is eroded, so too is the social and economic viability of those industries and coastal communities that historically have depended on the sea.

Harvest Refugia, Biodiversity Reserves and other MPAs as Precautionary Measures

MPAs are seen as not only an additional management tool, but also the only insurance against stock collapse and biodiversity losses due to excessive fishing effort, non-sustainable fishing practices, habitat degradation, or imprecise estimation of stock size. The MPAs envisaged under the *Oceans Act* appear to fall primarily within the category of harvest refugia or biodiversity reserves. Harvest refugia and biodiversity reserves are regarded globally as two precautionary management tools to safeguard living marine resources and the marine environment (United Nations, 1992; Conference of the Parties to the Convention on Biological Diversity, 1995, United Nations, 1995)

The precautionary approach is an important guiding principle to MPA establishment, but the questions where, when, how, and how many remain to be answered. If an area contains a population of highly endangered species, failure to protect the region might lead to that species' extinction or extirpation, making the region a good candidate for protection. Similarly, if an area is in near-natural condition and is representative of a wider ecosystem, it may make sense to protect the area to prevent damage in the future. What criteria should be used? How should *Oceans Act* MPAs link to other MPAs? What is the big picture?

B. GUIDELINES

The following are general guidelines. They raise some of the practical issues stakeholders must consider. Options for the establishment and management of Offshore MPAs are suggested. They are intended to provoke discussion and to clarify the views of stakeholders. These options are based on a review of the literature, discussions with domestic and international practitioners, and discussions with Canadian ocean stakeholders.

5. A NATIONAL FRAMEWORK FOR OFFSHORE MPAs

Integrated Ocean Governance

Guideline 1: Develop offshore MPAs within a national oceans management framework.

Marine ecosystems are vast, interconnected, dynamic, varied and fluid. A holistic or 'integrated' approach to marine conservation and management is recognized as essential in international agreements such as the Law of the Sea (United Nations, 1982), Convention on Biological Diversity (United Nations, 1992), the Jakarta Mandate (Conference of the Parties to the Convention on Biological Diversity, 1995) and is considered necessary to achieve sustainable ecological use by practitioners the world over. This principle of integration is now a governing concept of marine resource conservation and management in Canada pursuant to the *Oceans Act* (Canada, 1996).

The *Oceans Act* is enabling legislation: it provides only the umbrella authorization to conserve and manage the EEZ. The Act provides the overarching guiding principles for managing ocean space: integrated management, sustainable development and precaution (article 30). These principles will also guide the selection, establishment and management of MPAs. The specifics remain to be determined. Nonetheless, the Act signals macro-change that requires a professional systems-oriented approach to create both a shared vision and action plans among all stakeholders. Fragmentary reform must be avoided, wherever possible.

It is well recognized, in both industrialized and developing coastal States, that MPAs are a critical feature of ocean resource planning and management. The establishment of MPAs, for many stakeholders, begs the greater question: how is the EEZ to be managed and developed in an integrated and sustainable way as required by the *Oceans Act*? What is the larger management context within which MPAs are designated? Are there unprotected marine areas? What happens in the unprotected marine areas? These issues are relevant in that the actual effectiveness or degree of effectiveness of some reserves will depend on the protection provided outside reserve boundaries (Carr and Reed, 1992; Agardy, 1994; Kenchington and Bleakley, 1994). In order to address these issues, stakeholders are interested in the formulation of the ocean management strategy (OMS) under the *Oceans Act*. This process has begun with the publication of a discussion paper (DFO, 1998).

Ideally, decisions regarding the establishment of offshore MPAs should be made within an integrated national framework to safeguard and govern the use of ocean space and resources for present and future generations. Without such a framework, decisions about establishing MPAs will be fragmented and limited in effectiveness. Activities in areas outside the MPAs must be coordinated and complimentary to achieve the conservation objectives of the MPA as well as promote sustainable development of the EEZ (*i.e.* coastal zone, offshore area, high seas, adjacent EEZs and other international areas).

While recognizing that integrated ocean governance is critical to provide the necessary macro-management context, MPAs are a legitimate use of the sea and should be established. The precautionary approach dictates that the identification and establishment of MPAs should not be delayed until the Ocean Management Strategy is in place and operating effectively. Instead, the development of a national MPA Strategy should be a concurrent and coordinated activity within the ongoing development of a national ocean policy framework.

Guideline 2: Engage in both short-term and long-term strategic planning (with clear objectives, strategy and action plan) for each coastal region in collaboration with key stakeholders.

Need for three, broad conservation zones within the EEZ

Canada should develop and implement both short and long-term regionally-based, strategic ocean management plans for the three maritime EEZs. This strategic plan should provide for a diverse range of ecologically sustainable and appropriate experiences and uses of the EEZ off each coast. Within each there are different uses and users. These uses and users will change over time with advances in technology, economics, and level of exploitation. To sustain the resources and protect the marine environment, these multiple uses and users need both a short term (5 to 10 year) and long term (25 year) strategic plan to conserve and manage the area. By developing such plans, Canada will introduce integrated and sustainable ecological management of its ocean space.

In establishing an oceans policy framework, and in keeping with international obligations and domestic legislation, Canada should divide the EEZ off each coast into three broad conservation zones:

i) some large, representative MPAs designated as natural and undisturbed to safeguard the species, ecosystems, habitats, genetic diversity, etc. found in the marine environment, in light of existing knowledge and the precautionary approach;

ii) other MPAs (harvest refugia, biodiversity reserves, etc.) permitting ecologically sustainable activities; and,

iii) manage the remainder of the EEZ in an integrated, sustainable manner for present and future generations .

In developing the strategy with stakeholders, the terms and scope of these three conservation zones will be elaborated. Categories of MPAs may be identified. Certain marine areas may be identified for protection. A proportion of the EEZ may be designated as MPA where impacts are constrained and the sea is free from structures and extraction. Some MPAs, depending on the objectives, may be divided into zones characterized by differing intensities of human use. In these sites, core areas would provide strict conservation surrounded by buffer and transition zones where human use is allowed but regulated. The remaining EEZ area would be subject to integrated sea use planning and management.

Strategic planning should be a regional responsibility

Each region, together with the stakeholders, should be responsible for developing a strategy for the protection, conservation (wise use) and sustainable ecological development of marine environment. Such a strategy will serve as an overarching policy framework. Within this framework, a coordinated system of MPAs under the *Oceans Act* (Canada, 1996), the *Canada Wildlife Act* (Canada, 1995b) and the *National Parks Act* (Canada, 1995a) could be established within the EEZ. The network of marine protected areas would then be brought into a coordinated management framework to ensure the legislative and conservation objectives are achieved through a complimentary and comprehensive program.

The planning process should be inclusive and participatory

Lessons learned from other experiences in Canada and abroad (particularly in Australia, New Zealand and Tanzania) indicate that a strategic plan developed by all stakeholders (all levels of government, all user groups and interests) through a participatory process will result in a shared, system-wide vision. This vision will provide the framework to plan and operate MPAs and other human activities within the marine area. The strategic plan outlines the reasonable use, objectives, targets, and critical issues of the three marine regions. Such an approach is designed to ensure that the various agencies, user groups and interests develop a shared future for marine resource conservation and protection; and share the responsibility for realizing that goal. An important corollary of the process of empowering partners to collaboratively shape the future is recognition of the need to share accountability and responsibility.

In Australia, active participation in the development of the framework and Strategic Plan for the management of the Great Barrier Reef Marine Park (GBRMP) was widespread and intentionally solicited. The Strategic Plan is to be implemented by the actions of all relevant stakeholders in accordance with an agreed implementation schedule. Stakeholder agencies, industries and organizations considered the costs of implementation and cost-sharing. Stakeholders in Australia were already carrying out many of the significant initiatives in the proposed Plan under existing programs and within existing budgets. The initial Plan provides a regional overview, agreed future direction, guidance to those using the MPA, organisations and groups for their annual planning and decision-making.

The approach taken by DFO in publishing a discussion paper on MPAs (DFO, 1997) indicates a willingness to consult with stakeholders from the inception of the program. Key players and interested parties will be mailed further information and actively encouraged to participate in the process at a later stage through workshops, meetings and other events. These guidelines suggest an approach to further promote and achieve multi-stakeholder participation and collaboration in the development of policies, guidelines and strategies for the establishment, management and monitoring of MPAs in Canada.

A System of National MPAs

Guideline 3: Create a national 'system' of offshore MPAs that is consistent and coordinated to safeguard ocean space and its resources effectively and efficiently.

A systems approach is essential

International experience in the establishment of MPAs indicates that a systematic approach is required. The systems approach incorporates many of the principles that underlie ecosystem based planning and integrated decision-making. According to Kelleher and Kenchington (1991: 27):

> The most recent scientific method for organizing information is called the systems approach. The mode of thought in this system is one of synthesis. That is, in problem solving, it recognizes the importance of analysis of separate issues, but stresses a complete view of all the issues or 'systems' that are involved. In other words, the systems approach is dedicated to putting things together through synthesis.

The federal strategy should be coordinated and collaborative

There are many ideas, definitions, and approaches to the establishment of MPAs. Canada has presently three legislative instruments for establishing Offshore MPAs under the *Oceans Act*, the *Canada Wildlife Act* and the *National Parks Act*. Inherent in the notion of integrated ocean management is integration and coordination of all national MPA programs. The objectives and plans of these three MPA programmes should form part of an integrated whole to safeguard the environment and meet international and domestic obligations. It is therefore essential that the three departments responsible for implementing these Acts harmonize and coordinate federal legislation, policies and programs to meet national and international objectives and obligations.

Interdepartmental collaboration is always important: it is particularly important for offshore sites, not only to achieve the conservation objectives but also to effectively and efficiently implement the national programmes. Neither DFO, nor any other agency, has the capacity or the authority to unilaterally implement the full suite of measures required to establish, manage, monitor, and enforce offshore MPAs. Success depends on collaboration, cooperation and partnerships. Sharing of government resources and information will be necessary to effectively manage, monitor and enforce the MPAs. DFO, as the lead agency under the *Oceans Act*, must coordinate the collaborative creation of a national system of MPAs, building upon existing efforts and each other's experience.

Generally, objectives, roles and responsibilities need to be clarified. The three federal legislative instruments provide for a spectrum of protection to cover a range of conservation and management objectives. Section 35(1) of the *Oceans Act* provides five general objectives. A national MPA system must have clear objectives, articulated for each department; duplications in existing legislation must be eliminated and gaps must be identified and addressed. The three departments, together with other relevant agencies and stakeholders, should build upon their strengths and work together to identify, establish and monitor sites. Joint designations of offshore sites, where two or more departments have interests, will provide economies of scale, administration, and potentially a more comprehensive and integrated perspective.

The question remains: is this sufficient to safeguard the marine ecosystem? A national system of protected areas must be primarily ecologically-based to meet the global biodiversity conservation objectives under the Convention on Biological Diversity (United Nations, 1992), and nationally, under the *Oceans Act*, the *CWA*, and the *National Parks Act*. DFO, together with these other federal departments, will have to clearly formulate a national MPA programme with clear objectives for sites designated under each legislation.

A system for classifying MPAs within the national system should be developed

The term 'MPA' is used nationally and internationally to describe a variety of sites, to serve a variety of purposes, and achieve diverse objectives. MPAs are viewed by many as another legitimate use and allocation of ocean space, imperative to resource and environmental security; others are interested the wilderness values; others in research; others in tourism, education and recreation; others in economic opportunities; and in a fisheries context, MPAs in Canada are regarded as a new name for an old concept -- closed areas. But they are not closed to fisheries in all cases. Much depends on the site and the objectives. Accordingly, there still is much confusion over what an MPA is. Is it a multiple purpose area? For what purposes? Is it a marine park? Is it a marine sanctuary? Is it a defined area or is it a temporal refugia moving with the species to be protected? Is it all of the above? None of the above?

The *Oceans Act* leaves the definition of an MPA open for interpretation. The MPA Discussion Paper (DFO, 1997) provides some suggestions. Ultimately, this issue is left to the policy-making process to refine and define the application. DFO, CWS and Parks Canada should develop a nomenclature to distinguish the different MPAs and the corresponding human activity permitted depending on the conservation objectives, e.g.. marine reserves, marine refuges, marine sanctuaries, marine parks, marine conservation areas, marine wildlife areas, marine wildlife corridors, etc. One of the more controversial and increasingly popular classifications (with scientists, industry and the general public) is the 'no take area'.

There is a strong case for no take areas

Fisheries scientists and industry members are increasingly calling for 'no-take' reserves (Agardy, 1995; Ballantine, 1997; Roberts, 1997; Walters and Maguire, 1996). For these reasons, a panel of experts at the 1995 American Fisheries Society Annual Meeting recommended that at least 20% of the Southwest Atlantic be set aside as marine fishery reserves (Roberts, 1997). And Walters and Maguire recently argued, "if you want to make sure that no more than 20% of the fish are caught in any year, then make sure than no more than 20% are exposed to fishing gear" (1996. 134). Commentators generally agree that in the remaining 80% of the EEZ, a spectrum of protection and a variety of MPAs will be required to safeguard the integrity of the marine ecosystem for present and future generations. For example, Australia will zone at least 10-15% of each major habitat type found within the GBRMP as free from commercial and recreational fishing; and 30-50% of each major habitat type is zoned free from structures (other than mooring buoys) (Great Barrier Reef Marine Park Authority, 1994).

MPAs also provide a control area or ecological benchmark to provide a reference to monitor the impact of human activities. Some commentators and countries over the last twenty years have advocated the allocation of a protected transect or wildlife corridor within the EEZ. Australia has done this within the Great Barrier Reef. Canada could establish a protected transect or wildlife corridor running from the baseline of the territorial sea to the 200 mile limit of the EEZ off each coast. This transect could be a protected no take, no waste dumping area covering differing ecosystems and habitats. As part of the oceans strategy and MPA system, Canadians should establish an agreed percentage, no less than 10%, of the marine area off each coast as a no-take, no waste dumping protected area for biodiversity conservation and reference purposes. These areas would also serve as an ecological benchmark to monitor human activities in other areas.

MPAs in other contexts, depending on the objectives, may allow fishing throughout the site, or permit only certain gear, or fishing for certain species, or permit fishing during certain times of the year, or only in certain areas within the site. Similarly, other extractive uses may be found ecologically sustainable and be permitted under certain conditions. In these areas, best practical management and appropriate regulation will be considered as sufficient to safeguard the environment. Such regulatory and access management on a sector by sector basis is well established. Under MPA management, the conservation objectives will be clear and the site managed according to an integrated, cross-sectoral strategy.

Guideline 4: Within the national MPA system, develop a regional 'network' of offshore and coastal MPAs designed to achieve specific conservation objectives.

The case for a network approach

Researchers and practitioners (Ballantine 1991, Bohnsack, 1993, Castilla and Fernández, 1996; Dyer and Holland, 1991; Quinn *et al.*, 1993; Salm and Clark, 1989) "advocate the establishment of a network of sites to achieve conservation objectives for the following reasons:

1. MPAs are required for all habitats and all regions, not just those perceived as attractive, important or unique, in order to conserve species, genetic, habitat and ecosystem biodiversity, promote sustainablity and avoid the *tragedy of the commons* (Hardin, 1966). While endangered species, unique locations and special habitats must be protected, sites to safeguard the typical and common must also be established to avoid widespread declines and degradation (Ballantine, 1995). To ensure ecological and biogeographic representation, a network of several MPAs must be established.

2. Given that marine organisms often have a large geographic range with dispersal and migration patterns varying with different life stages, several interconnecting but spatially separate sites are needed. Species are protected over the range of dispersal patterns and life cycles. The nursery areas, spawning sites and calving sites are known for many target and non-target species. Protecting some of these areas or portions of these areas addresses the decoupling of reproduction from recruitment in conventional management.

3. Adequate coverage or 'enough habitat' is needed to achieve the conservation objectives (Allison *et. al.*, 1998). Depending on the conservation objectives, this usually means that a network of several sites is needed to provide sufficient coverage to be effective. Several smaller sites may be a practical and preferred alternative to a few large sites.

4. Individual reserve effectiveness within the network is enhanced, particularly for population replenishment, within and outside the reserve.

5. A network design is based on ecosystem management principles. All components affecting the marine ecosystem are taken into consideration in designing, monitoring and evaluating the reserve network. For example, prevailing currents, wind, temperature, upwelling and other natural and physical features are important considerations in a network designed to protect larvae, fish aggregations, *etc.*

6. To ensure ecological and biogeographic representation, reserves must also include replicates (Ballantine, 1996). Replicates within a network design are contingencies, intended to reduce the risks of errors, accidents, coincidences and natural variations compromising the effectiveness of a single site.

7. By establishing a network of reserves throughout a significant portion of the geographic range or habitat, the risk of a single reserve being affected by a natural or human induced perturbation is spread.

8. The density of the network should be sufficient to ensure self-sustainability (Ballantine, 1995). The number and size of reserves within a network is a design question as well as a political decision depending on the reserve goals. Several small reserves may be just as

effective as a few large reserves. Such decisions must be based on existing knowledge, however limited the predictive ability.

A network of multiple, spatially separate reserves provide several replicate source populations, reduce region-wide anomalous effects on a single reserve and increase the benefits to non-reserve areas. Networks of reserves are therefore a practical and effective means of providing the necessary protection while restricting a relatively, small fraction of the exploited area and the EEZ.

Developing the network one site at a time vs. comprehensive design

While one-off sites may be effective to protect a certain habitat or 'hot spot', generally a network design is preferred for harvest refugia. It is not, however, necessary to design the entire network before establishing a site. Even in networks, reserves are often implemented one at a time (Ballantine, 1991). Indeed, the precautionary approach dictates that marine reserves should be established immediately to supplement and complement current conservation and management efforts. An offshore site can be established while other sites in the network are in the identification and planning stages.

Information Needs

Most information required to establish a reserve and design a network is available from different sources, disciplines, users and other stakeholders. This information can be compiled, mapped and analyzed in a relatively short time. Over the last few years, Parks Canada has compiled such an inventory for each of its 29 marine regions in Canada. This inventory can be updated and expanded for the development of the national MPA system and for regional networks.

General and Specific Objectives

Both general and specific objectives should be clearly articulated for the establishment of regional networks and individual offshore sites. Clarifying objectives is essential if the goal of a comprehensive network is to be achieved. The *Oceans Act* provides at least five general conservation objectives: 1) to ensure adequate species biomass and species potential in different habitats; 2) to ensure a variety of ages in stocks; 3) to safeguard ecological processes; 4) to protect critical habitat; and 5) to ensure control of fisheries.

Specific objectives must also be developed for each site and each network. Clarifying the objectives will facilitate the design of the MPA and the management needs.

Collaborative And Participatory Strategy Development

Guideline 5: Develop an open, transparent, and fair process to ensure the effective participation and collaboration of all stakeholders from the outset.

An open process is the preferred approach

An open, transparent, participatory planning and management process involving all key stakeholders is generally considered the preferred approach in both developing and industrialized countries. Stakeholders should collaborate in the development of the oceans management strategy as well as the identification, selection, establishment, management, monitoring and review of MPAs. Such an approach will not only be more efficient and cost-effective, but it will also build trust and ensure a higher degree of acceptance and compliance by all interest groups. This process need not be complex: in fact, this process should be as simple and straightforward as possible.

Stakeholders are many, diverse and often competing

Consultations pertaining to marine issues over the last six years indicate there is a well established and expanding constituency of stakeholders interested in the use of ocean space in Canada.[iii] These stakeholders are generally well informed and have a vested interest in the sustainable development of marine resources. Canadian stakeholders have repeatedly expressed the need for coordinated planning and management of coastal and marine resources. The ocean stakeholders want to participate in ocean policy formulation and decision making. But these stakeholders are not a homogeneous group. They are diverse and represent many sectors and many values. And within these individual sectors there are many diverse groups: for example, the fishing industry is composed of many, often disparate, affiliations; so too is the NGO community. Furthermore, members of the general public are increasingly expressing their interest in the conservation of the marine environment and recognizing their right to comment on how the sea, a common property resource, their resource, is used and managed.

Offshore marine resources are generally viewed as common property belonging to everyone or to no one; others view offshore marine resources as capable of having property rights for private, corporate or communal gain; still others see ocean space as a public resource held in trust by the coastal State for the common heritage of all. There are other perspectives still. There are probably almost as many perspectives as there are stakeholders. Stakeholders have a variety of reasons for their interest in the offshore: legislated responsibility; legal title; commercial; recreational; scientific research; wilderness value of the habitat, fauna or flora; etc. Competition for ocean use and conflicts are common. Inter-sector and intra-sector conflict is prevalent and increasing.

Effective consultation and participation is key

The question remains how to design a process which results in effective consultation and participation? It is clear from experiences in both developing and industrialized countries that a successful MPA programme depends on comprehensive and effective participation of all stakeholders from the outset. An open, transparent and accessible process is necessary to obtain the input of stakeholders and garner widespread support for the policies and programs. Ownership of the problem, the identified solutions, and the responsibility for implementing the action plans must be developed in a collaborative manner and shared by all stakeholders. These guidelines suggest an approach to achieve effective stakeholder participation. There may be other approaches. Whatever the process selected, the goal is the same: to adopt a shared vision through a collaborative, inclusive, transparent process. This process will vest the ownership and responsibility for shaping the future management and conservation of the EEZ in the 'community' interested in using and sustaining the offshore.

Generating public interest and stakeholder support

The IUCN noted in 1993 that "the key to protecting a cherished landscape lies within the communities that call it home" (IUCN, 1993). This is true for both nearshore and offshore MPAs. However, the ability to generate public interest and local community support for offshore 'home' sites may be more difficult than for terrestrial or coastal areas. On the other hand, there may be fewer conflicts and fewer stakeholders offshore, thereby increasing the likelihood of finding common ground and accelerating the establishment of an offshore site. Nonetheless, the key to success appears to be achieving a common vision, objectives and shared values for the conservation and management of the ocean space (Shurcliffe, pers. comm. 1997; Bailey, email, 1997). To do so, all these interests and views must be taken into account and given a full and fair opportunity to participate.

In the context of implementing the *Outer Continental Shelf Lands Act* (United States, 1953) in the U.S., (Lester, 1995) addresses the issue of "re-discovering the public interest". The lack of progress, with respect to implementation of this Act, is traced to a failure to build a constituency of support in the general public. By contrast, the enormous success of the Great Barrier Reef Marine Park Authority is often attributed not only to their ability to solicit and achieve stakeholder collaboration and consensus, but also to build broad-based public support. There are four key lessons to be learned from these and other experiences which have direct application to the establishment of MPAs in the Canadian offshore:

- decentralize decision making to the regions where the legislation, program or policy is most relevant;
- establish regional decision-making bodies with all the major stakeholders;
- allocate costs and benefits of program implementation and development to the regional decision making bodies; and,
- institutionalize a public consultation mechanism as a component of MPA site designation and management.

Introducing these policies in Canada will mean a change in institutional structure, empowering communities and other stakeholders, building stakeholder capacity and developing a public education and consultation programs to achieve the necessary constituency of support for sustainable ecological development and MPAs in the three EEZ regions.

Need for collaboration and partnership from the outset

Consultation and effective participation from the outset with all government, aboriginal, industry, academic, NGO, recreational, and public stakeholders is critical to building this constituency of support, whether the goal is establishing one offshore MPA site or a MPA network. No stakeholder has the capacity or authority to unilaterally implement the full suite of measures required to establish, manage, monitor, and enforce MPAs. Success depends on collaboration, cooperation and partnerships amongst:

- federal government departments;
- other levels of government including provincial and aboriginal governments;
- other sovereign governments;
- international organizations;
- key industries, i.e. fishing, offshore mining and petroleum, shipping, tourism, etc.;
- academia;
- NGOs; and,
- the public sector.

The establishment and management of an MPA site or network will be compromised by the failure to develop these partnerships early in the process. As lead agency, DFO must coordinate and facilitate the development of these partnerships to successfully implement the broad reforms introduced under the *Oceans Act.*

Collaboration and participation: how to find common ground

In *Discovering Common Ground,* Marvin Weisbord (1992) devotes an entire chapter to the subject of building collaborative communities. Weisbord states that not only is it possible to find common ground amongst stakeholders whose interests are widely disparate, and perhaps even in conflict, but he also found "a great hunger for community collaboration existed everywhere" (Weisbord, 1992: 36). The challenge is not whether the will to cooperate is present as much as how to facilitate collaboration. Weisbord has developed a process called Future Search in which stakeholders attend a two to three day conference where they search for solutions and resolutions to complex problems by designing a shared vision (goals and objectives) and a practical response (strategy and action plan). Documented results of Weisbord's research and experience with Future Search conferencing are:

- creative and achievable strategies
- collaborative and participative approaches
- consensus generation
- shared values
- commitment to strategies formulated
- the combination of formulation and implementation
- learning from each other and educating members new to the situation
- the integration of cultural, regional or value differences
- completing a task in two or three days that would take months if left to the specialized analysts and experts.

(Weisbord, 1992: 80)

The Future Search Conference methodology should be considered in developing a shared vision and action plans to achieve integrated management and sustainable ecological use nationally and for each coast. This internationally recognized approach is highly effective and recommended by professionals in Australia, the United States and in Canada (Weisbord, 1992). The future search model is adaptable to many complex situations not easily managed by traditional means.

Planning the future search conference

- DFO, as the lead agency, should establish a multi-stakeholder team to act as the project manager and coordinate the Future Search conferences in each region. The project management team would plan the Future Search conferences together with the professional Future Search facilitators/managers.
- As many of the key stakeholders, or their representatives, should participate in the future search conference. No more than 60 individuals should participate in one conference. Several conferences of 60 participants could be run simultaneously, with plenary meetings at critical times to exchange views and review progress. Two professional Future Search facilitators/managers would organize and lead each conference, which typically run two to three days. A shared future scenario and implementation plans are routine outcomes of this model.
- Prior to the multi-stakeholder conferences, separate, concurrent non-government (broadly defined) and government (federal, provincial and aboriginal) future search workshops may be held. This would allow the stakeholder groups an opportunity to formulate a coordinated view. Representatives of all stakeholders would then convene in each marine region for a future search conference.
- The Conference participants develop a joint comprehensive and integrated policy framework, operating guidelines and strategic plan for each marine region. The strategic plan would have objectives and action plans for both the short term (five year) and the long term (25 years).
- Feedback on these policies and plans by the stakeholder organizations may lead to another workshop or formal endorsement. Outstanding issues would be identified and either resolved through mediation or other mechanisms or left unaddressed.
- The process should take no more than two years. Note: this does not prevent the establishment of MPAs in the interim, in keeping with the precautionary approach.
- The costs associated with consultation and participation must be factored into the integrated oceans management and MPA program budget. The benefits derived from a successful consultation process are considerable. It is estimated that DFO should budget $100,000 per marine region (*i.e.* Atlantic, Pacific and Arctic) to plan, organize and implement the Future Search Conferences.

Funding

Guideline 6: Develop a multi-stakeholder funding strategy with in cash and in kind commitments from governments, industry, NGOs, and others to implement strategy

A general fund will be required for developing the national system and regional networks of MPAs. As well, specific budgets will be required for individual offshore sites. Canada should develop a collaborative funding strategy modeled on the Australian approach. Australia has developed a collaborative funding strategy for each of its MPAs to ensure effective management of the sites (see GBRMPA, 1994). They identified existing roles and responsibilities and associated budgets during the strategy development process and determined future budgetary commitments. Several activities were already undertaken and underwritten by industry sectors, NGOs, universities and other research institutions, etc. Where additional financial resources were required, fund raising schemes were proposed and developed. For example, a foundation was recently established to raise money for research and management of the Great Barrier Reef World Heritage Area.

Many stakeholders and agencies in Canada are already involved in offshore activities. By coordinating and integrating the functions and the expenditures, there are economies of scale and significant gains for all. Recognizing that this is a collaborative effort, DFO must coordinate and formalize the partnerships to share the responsibilities as well as the benefits.

Multi-Stakeholder Institutional Arrangement

Guideline 7: Create a multi-stakeholder, regionally-based, institutional mechanism to coordinate and manage the establishment and management of MPAs.

In order to implement the macro-reform called for in the *Oceans Act* and establish a national system of MPA networks, a collaborative institutional mechanism must be created. The existing sectoral approach must be replaced with an integrated structure, one that is integrated both vertically (all levels of government, NGOs, indigenous peoples, communities, private sector) and horizontally (cross-sectoral). To do this, modern participatory management systems must be formalized.

DFO, as the lead agency empowered under the *Oceans Act* to facilitate and coordinate the ocean management strategy process, including the establishment of MPAs, should propose interdepartmental arrangements and introduce institutional changes to establish MPAs, where it has the authority, to achieve ecologically sustainable development. The ongoing success of the OMS and the MPA system will depend on consistent and competent leadership and management provided by an institutional mechanism that will be transparent and accountable.

Proposed institutional framework

- Establish four inter-governmental (federal/provincial/aboriginal) steering committees

    i Integrated Ocean Management Steering Committee
    ii MPA Steering Committee
    iii ICZM Steering Committee
    iv MEQ Steering Committee

- Establish a Marine Regions Conservation Authority (MRCA). This is an independent, multi-stakeholder body responsible for providing advice and recommendations to the Government of Canada on formulating and implementing integrated ocean management plan (IOMP) for each region and MPAs. The Chair of the MRCA reports directly to the Minister of Fisheries and the Oceans Inter-Ministerial Cabinet Committee.

- Establish several consultative committees within the MRCA to achieve sustainable ecological development of three marine EEZs. These committees would include an ICZM committee, a Sea Use Planning Committee, and a MPA Committee.

- Establish an MPA Committee for each coast. This is an independent, multi-stakeholder committee of the MRCA (composed of representatives of all key stakeholders), dedicated to developing the strategic plan for establishing MPAs within the IOMP. The MPA Committee would be responsible for developing the vision (through Future Search conferences/workshops), the strategic plan, operating guidelines, as well as identifying and selecting MPAs, and developing the management plans with assistance from Federal and Regional MPA Task Forces.

- Establish a Federal MPA Task Force. This task force is a dedicated, full time group composed of seconded civil servants and new staff, responsible for coordinating the MPA process in the three regions and act as secretariat to MRCC.

- Establish a Regional MPA Task Force for each EEZ. Each regional task force has dedicated, full time staff composed of seconded civil servants and new staff, responsible for managing MPA process in respective regions and act as secretariat to MRCA MPA Committee in the region.

- Establish a multi-stakeholder MPA Advisory Committee for each Offshore MPA. This Advisory Committee would work closely with the Regional MRCA MPA Committee.

Guideline 8: Ensure that multi-stakeholder, institutional structure has the capacity to interact effectively with all stakeholders.

Whatever institutional arrangement is established, it is vital that it have sufficient resources and political support to carry out its mandate. The *Oceans Act* provides for public consultation. Public consultation regarding the establishment of an offshore MPA needs to occur at the earliest possible stage to ensure it is effective. Participation must continue throughout the process.

Integrated, Strategic, Multi-Stakeholder Research Program

Guideline 9: Establish an integrated, strategic, multi-stakeholder marine research program including federal and provincial government departments, universities, research institutes, NGOs, industry and others.

The achievement of the conservation and ecologically sustainable use of ocean space and its resources will depend in part on the knowledge and understanding gained from basic and applied research and monitoring. In order to obtain and disseminate timely and accurate information helpful to decision makers and stakeholders, there is a need for a strategically driven research and monitoring program. Information needs must be identified and prioritized in conjunction with stakeholders. The results of research, monitoring and applications should be disseminated through refereed publications, management recommendations and extension materials.

A strategic research program should be established in each ocean region, integrating research inputs from different stakeholders. Under such a program, researchers (broadly defined to include industry participants, NGOs, academia, government, *etc.*) would identify critical information needs, coordinate research required to better understand the natural systems, and help answer management questions. Results from ongoing research would feed into the monitoring and evaluation processes and the adaptive management strategy. Some of the objectives of this strategic research program would be to:

- Develop mechanisms for sharing and accessing data and information and for coordinating and rationalising research effort.
- Compile a comprehensive inventory of the natural, cultural and resource use patterns for the EEZ. Establish a publicly accessible network of systems for the storage, retrieval, dissemination, and review of existing and newly acquired, non-confidential information
- Accelerate the compilation of a comprehensive inventory of the natural and cultural resources of proposed sites, the patterns of use and potential uses
- Obtain commitments to long term funding and in kind support from government, industry, NGOs, universities, and others.
- Establish an integrated EEZ-wide monitoring program.

- Develop over time an information and knowledge base of the basic ecological, geological and physical processes occurring in the EEZ to assist with policies and decisions regarding ecologically sustainable multiple use.
- Develop a research program designed to improve the selection and management of MPAs
- Develop research and monitoring programs to improve the understanding of the effects of fishing on non-target and target species and their habitats.
- Develop research and monitoring programs to improve the understanding of the effects of tourism and recreation on the marine ecosystem.
- Conduct research into the socio-economic characteristics and effects of different uses affecting the EEZ and specific offshore MPAs.
- Conduct research to improve the capacity to determine the economic values of selected biological communities and uses of the EEZ and in specific offshore MPAs.

6.0 IDENTIFYING, SELECTING AND DESIGNING OFFSHORE MPAs

Guideline 10: Develop a fair, transparent, and participatory process for the identification, selection and design of offshore MPAs

Overview

Flexible, fair process open to all stakeholders

A fair, transparent and participatory selection process is imperative. This process should provide sufficient opportunity for all stakeholders to effectively participate and for their concerns to be heard and addressed. More than one selection procedure should be introduced to provide flexibility and ensure that certain offshore sites warranting interim or special protection can be fast tracked. Certain offshore sites should be established expeditiously or afforded interim protection for a variety of reasons. For example, a preliminary Area Management Plan (AMP) may be a requirement of the nomination proposal, but this may require more time than prudent to protect the resource in question. If an area contains a population of endangered species, failure to protect the site might lead to that species' extinction or extirpation, making the area a candidate for immediate protection. Similarly, if an area is in near-natural condition and is representative of a wider ecosystem, protecting the area now may be necessary to prevent damage in the future. For these reasons a multi-prong approach to establishing offshore MPAs under the *Oceans Act* is advisable. This process should be coordinated and managed by the MRCA MPA Committee together with the Regional MPA Task Force.

Process

The identification of candidate offshore sites will be triggered by an open invitation by the MRCA MPA Committee for nominations. Once nominations are received they will be subject to a screening process. Screening of nomination proposals will be based on accepted selection criteria. Candidate sites will then be selected and reviewed through the agreed process(es). Sites will be selected based on existing information, wherever possible. Other proposals that do not satisfy the criteria should be rejected with reasons provided in writing to the nominee.

Following acceptance of a proposal, the MRCA MPA Committee should announce the candidate site in the media and notify key stakeholders. Candidate sites will then be subject to a public review process in which the merits of the preliminary Area Management Plan are considered and further developed. The review process should include information sessions, meetings with stakeholders, and a series of public hearings held in the region. Dates and locations should be set early and widely publicized to provide sufficient notice. Ample time must be afforded to all stakeholders to review the proposed plan and to prepare written and oral submissions. The MRCA MPA Committee should hold hearings at different venues in the region. The hearings should be recorded and conducted in accordance with published procedures. Written reports of the hearings should be circulated to those who attended the meetings, available on internet and from the MRCA.

The MRCA MPA Committee, together with the MPA Task Force, will endeavour to resolve disputes and where agreement cannot be reached, may recommend that the matter be resolved through alternative dispute resolution or a panel of specialists. The MPA Committee may recommend that the candidate site be designated leaving the dispute unresolved. Upon completion of the review process, the MRCA MPA Committee will make a recommendation to the Minister(s) on the designation of the candidate site. The Committee's recommendation must be written and considered a matter of public record.

Developing Preliminary Area Management Plan

While recognizing that a large proportion of currently established marine reserves have no management plans (Kelleher *et al.*, 1995), the process is greatly improved if the site to be designated has a preliminary Area Management Plan. At a minimum, long term goals and clear objectives are necessary. Plans for MPAs should establish specific objectives for managing human use in order to achieve the management goals. Problems, possible solutions, possible constraints and options should be identified.

Over the course of the information sessions and public hearings, the MPA Committee and the MPA Task Force should refine and develop the preliminary Area Management Plan in conjunction with all relevant agencies and other stakeholders. It is important that all relevant stakeholders participate in the development of this preliminary Area Management Plan, not only to have coordinated planning, but also to have shared ownership of the plan. A Plan that seeks to impose programs without this consultation and involvement is likely to be far less effective.

Nomination

Guideline 11: Establish a broadly-based identification and nomination process

MPAs are one of a number of statutory and other mechanisms available for protecting the marine environment. The process of nominating areas for MPA status should be open to all stakeholder groups, including coastal communities, NGOs, non-profit organizations, universities, research institutes, industry associations, government departments, or other groups from the general public. Nominations should be submitted to the MRCA MPA Committee for consideration. Optimize the nomination and selection of protected areas, based on the public inventory, developed as part of the strategic marine research programme.

Guideline 12: Establish and publicize clear terms of reference for request for nomination proposals

Information and advice should be made available to all key stakeholders and the general public on all matters relating to MPAs. Prospective proponents should be advised of the appropriate procedures to nominate an Offshore MPA site. Proposals should be based on clear terms of reference: perhaps an elaboration of those appended to the DFO MPA Discussion Paper. Where possible, guidance should also be provided to prospective proponents, *e.g.* on sources of information in preparing proposals.

Selection Criteria

Guideline 13: Develop and publicize selection criteria for Offshore MPAs

The MRCA MPA Committee, together with the MPA Task Force, must develop and publish the criteria to be used in the selection of Offshore Sites. Criteria to guide this ranking process have been developed by a number of authors (Ballantine, 1991; Goldsmith, 1996; Kelleher and Kenchington, 1991; Norse, 1993; Salm and Price; 1995). An overview of these criteria is presented below, followed by a table that identifies the criteria most relevant to each class of MPAs identified in section 35 and 36 of the *Oceans Act*.

Criteria useful for evaluating marine protected areas

Kelleher and Kenchington (1991) identify eight classes of criteria against which potential protected areas should be judged. These are: Biogeographic characteristics; Ecological characteristics; Naturalness; Economic importance; Social importance; Scientific Importance; International or national significance; and Practicality or feasibility. Each of these criteria is equally important. Salm and Price (1995) have recently elaborated on these classes of criteria.

1. **Biogeographic criteria**

   Candidate sites scoring high on this criterion would:

   - contain rare biogeographic qualities; and/or,
   - be representative of a biogeographic 'type' or types; and/or,
   - contain unique or unusual geological features.

2. **Ecological criteria**

Candidate sites scoring high on this criterion would:

- contain an essential part of ecological processes or life-support systems (for example, a spawning area crucial to the supply of larvae in downstream areas); and/or,
- either by itself or in association with other protected areas, encompass a complete ecosystem or a large percentage of a complete ecosystem; and/or,
- contain a wide variety of habitats; and/or,
- contain habitat for rare or endangered species; and/or,
- contain nursery or juvenile areas; and/or,
- contain feeding, breeding or rest areas; and/or,
- contain rare or unique habitat for any species; and/or ,
- contain a high degree of genetic or species diversity or productivity.[11]

3. Naturalness

Candidate sites scoring high on this criterion would:

- have been well protected from, or had not been subject to, human-induced change; and/or,
- be a good candidate for remediation to a near-natural state.

4. Economic importance

Candidate sites scoring high on this criterion would:

- contribute to total economic value by virtue of its protection (*e.g.*: recreation, subsistence, use by traditional inhabitants, appreciation by tourists and others, serving as a refuge, nursery area or source of economically important species, replenishment of commercially important population or associated species); and/or,
- lead to potential economic loss by failure to provide protection.

5. Social Importance

Candidate sites scoring high on this criterion would provide existing or potential value to the local, national or international communities because of its heritage, historical, cultural, traditional, aesthetic, educational, or recreational qualities.

6. Scientific and education importance

Candidate sites scoring high on this criterion would be of high value for research, monitoring and education. Implicit in the 'scientific importance' and 'international or national significance' categories is the value that individual protected areas will have for a complete network of protected areas representing all of Canada's biogeographic regions. For instance, if a proposed protected area is controversial but represents the last intact portion of a particular ecosystem, it would be considered prudent, responsible and necessary to designate the site. The terrestrial equivalent is the protection of Canada's prairie grasslands.

7. International or national significance

Candidate sites scoring high on this criterion would:

- have the potential to be listed on the World (or national) Heritage List; and/or,
- have the potential to be declared a Biosphere Reserve; and/or,
- have the potential to be included on a list of areas of international or national importance; and/or,
- be or is the subject of an international or national conservation agreement.

8. Practicality or feasibility

Candidate sites scoring high on this criterion would:

- have a high degree of insulation from external destructive influences; and/or,
- be socially and politically acceptable; and/or,
- have a high degree of community support; and/or,
- be accessible for education, tourism, recreation; and/or,
- be reasonably compatible with existing uses.

Offshore protected areas are more difficult to monitor and enforce, and are less accessible than coastal protected areas, but this does not make them less valuable for scientific, educational, tourism, recreational or economic purposes: the Stellwagon Bank Marine Sanctuary and the Monterey Bay Marine Sanctuary in the United States, the Great Barrier Reef Marine Park, the Kermadec Island Reserve and the Wadden Sea are examples of successful sites.

The selection criteria and the techniques for assessing the application of the criteria developed by the MRCA MPA Committee to a particular proposal should be periodically reviewed and improved.

Information Considerations

Guideline 14: Identify, select and establish offshore MPAs based on the information now available, in keeping with the principles of precaution and sustainable development.

Policy and decision makers must balance the need for sufficient information to design an effective reserve with the need to protect conservation values by establishing a reserve based on existing information pursuant to the precautionary approach. Adopting the traditional 'wait and see approach' while information is gathered has historically lead to the foreclosure of protection opportunities and the further degradation of the marine environment. Uncertain, inadequate or lack of information is a constant factor in the natural environment; site identification, selection, design and management will always benefit from an improved understanding of relevant biological, ecological, oceanographic, economic and social processes.

First, sufficient information is available to design an effective MPA. Terrestrial wildlife parks were first established without extensive information to guide their design and management. These areas were identified based on existing information and established in the public interest. Similarly, marine reserves are and should be identified and established using existing information (Allison *et al.*, 1998; Shurcliffe, pers. comm, 1997). Parks Canada has identified representative marine areas (RMAs) for all but two of its 29 marine regions by compiling an inventory and maps of biological, oceanographic, geological and cultural characteristics for these regions together with present and future resource uses. Where information gaps exist they were identified. Generally, these information gaps are not critical to site identification nor area delimitation. Most, if not all, the necessary information DFO and the other stakeholders need to select, design and manage offshore sites can be obtained through consolidating existing knowledge bases in government, academia, industry and NGOs.

Second, the precautionary approach dictates that where conservation values are in need of protection, but information on design is limited or uncertain, the MPA should be larger or more sites should be established in the network to provide the necessary insurance. As the knowledge base grows and changes over time with advances in research and other stakeholder contributions, the MPA plan may be modified according to adaptive management practices. Further, once established, MPAs will serve as control areas and will enhance research efforts and the understanding of the marine ecosystem.

Guideline 15: Collect and map information from many disciplines where feasible

In general, ocean stakeholders are interested in knowing what the big picture looks like. What is the health of the marine environment? What resources are endangered, threatened, or vulnerable from overexploitation or habitat degradation? What are the present and future uses of this marine region? What is the potential for generating wealth from this ocean space? How can the need for environmental protection be balanced with economic development? What are the opportunities? What are the trade-offs? These information issues are the same whether one is developing a network of MPAs within an integrated management plan or establishing discrete sites.

Ideally, information from many disciplines should be collected to create, design and effectively manage one site or an entire system of MPAs. The question arises then as to what information is necessary and how accurate does this information need to be?

The amount and nature of information required to identify and establish an MPA largely depends on the general objectives of the ocean management regime and the specific objectives of the proposed site. For example, harvest refugia and biodiversity reserves would be identified based on scientific and traditional ecological information concerning the resources or the habitats.

Basic information

A basic list of information to select protected areas includes (Ballantine, 1991; Kelleher and Kenchington, 1991; Norse, 1993; Salm and Price, 1995):

Natural Sciences:

1. ***Database identification:*** compile a list of and obtain existing sources of information in Canada and abroad from academia, research institutes, governments, NGOs, private sector, non-profit sector, international organizations, etc.

2. ***A description of geographic, geological, and geomorphological features:*** a basic overview of the physical structure, or 'skeleton' of the candidate protected area, including bathymetric, tectonic, and surficial geologic details.

3. ***A description of oceanographic and meteorological influences:*** a basic understanding of the large scale factors (prevailing weather patterns and marine currents) affecting the candidate area. These factors include a discussion of prevailing winds, seasonal variation in air and water temperature, wave patterns, surface and deep-water currents, water chemistry, and, where appropriate, ice regimes.

4. ***A description of biological/ecological features:*** describe the organisms (phytoplankton and other marine plants, zooplankton, invertebrates and vertebrates) and ecological processes present in the proposed area. Both objective and more subjective indicators are included in this category.

    Objective indicators include: diversity measures such as species richness and composition, fauna categorized generally (*e.g.* macrobenthos, microbenthos, etc.), distributions and relative abundance patterns; trophic structure; habitat types and diversity; presence of critical habitat (spawning and nursery areas, migratory stopovers, and bottlenecks); productivity; species fecundity; baseline disease prevalence, levels of endemism; and presence of rare or endangered species.

    Subjective indicators include: community/biotope quality; vulnerability to development threats, measured in terms of 'fragility' in space (*e.g.*: small or isolated areas) and time (*e.g.*: a process that occur in a rapid, short burst, like a phytoplankton bloom); the area's ability to self-regulate without human intervention, measured in terms of 'ecosystem integrity; and, the extent to which the area has been protected from, or has not been subjected to, human-induced change, measured in terms of 'naturalness'.

5. ***Comparative values of area:*** It is important for design and monitoring purposes to obtain conservation values from different sites to compare the conservation values and assess the impacts of human activities on the area. Information from various activities (hydrocarbon exploration and development, fishing, shipping, *etc.*) should be collected, analyzed and integrated.

Social Sciences And Humanities:

1. ***Data base identification:*** Compile a list of and obtain existing sources of information in Canada and abroad from academia, research institutes, governments, NGOs, private sector, non-profit sector, international organizations, etc.

2 ***Economic issues:*** Information on the total economic value (existence, use and option value) of the resources within and adjacent to the proposed protected areas including: value of living resources currently extracted from the region; potential value of future extractive activities[12]; the existing or potential economic contribution of non-extractive, non-consumptive and passive uses including tourism, recreation, transportation [shipping] and subsistence harvesting); and the economic value associated with key ecological processes (e.g.: nursery or spawning areas). This is central to the sustainable development principle under the *Oceans Act*.

3. ***Social issues:*** Information that reflects human use and appreciation of the proposed protected area, including: a review of historic and current use of the region; cultural importance of the region; educational value of the region; aesthetic value; intrinsic value; and international ('common heritage') value. The latter reflects Canada's role as trustee or custodian of the marine environment on behalf of the global community.

4. ***Impacts:*** Information regarding the effects of human activity (and the scale at which they are occurring) in the proposed protected area. This information will assist in monitoring remediation in areas adversely affected by human activities. Information includes impacts on *ecosystem structure*[13] and *ecosystem function*[14] .

   Measures of ecosystem structure include: number of species; number of rare, threatened or endangered species; numbers of introduced species; species richness; numbers of species per trophic level; number of fish stocks contributing to catch (as a measure of the way in which the trophic structure is affected); amount of intact habitat types compared to historic baselines; size range within species; mass of largest species; spatial distribution of species, particularly their distribution by depth and habitat/substrate type and species specialization (Harding, 1996; Koslow, pers comm 1997).

   Measures of ecosystem function include: primary productivity and nutrient cycling; contaminant levels by trophic level; population surveys; coastal restructuring; estuary loss; benthic smothering; biochemical indices of exposure; disease prevalence; species fecundity (Harding, 1996); food web structure; habitat dependencies of the species, which may vary by life-history stage; physical and biological determinants of community structure, e.g. temperature, currents, substrate, keystone predators, seasonal and interannual variability in food input and physical variables (Koslow, pers. comm 1997)

Guideline 16: Determine outstanding information needs required for designing offshore MPA.

If there are any outstanding information needs required to develop the preliminary Area Management Plan prior to designating a site, these should be identified as early as possible and a team of researchers assigned the task. The precautionary approach should be the guiding principle in determining the necessity of obtaining this information as well as the amount of information and degree of accuracy required to design the plan.

Preliminary Area Management Plan

Guideline 17: Develop preliminary Area Management Plan

The need for a management plan

The management of activities in offshore MPAs requires the application of broad measures over wide geographic areas to deal with problems that are diffuse in character. For example, the establishment of water quality standards will be necessary to ensure that the general environment does not deteriorate. These measures will most likely extend beyond the immediate area of the MPA. In addition, the management of localized activities within the boundaries of the MPA will require more focused, area based measures dealing, for example, with the potential site impacts from activities such as fishing and shipping. The remoteness of offshore MPAs makes the management task difficult: although there may be fewer activities compared to inshore sites, infringements of regulations and codes of practice are more difficult to observe, and a rapid response to deal with problems may not always be possible. This section of the guidelines considers how this task can be achieved.

Develop a long term strategic area management plan

An acceptable, preliminary Area Management Plan need not address all the issues before a candidate offshore site can be designated. To facilitate progress and in keeping with the precautionary approach, a long term strategic management plan with broad statements and general principles (*i.e.* 80% of the area should be free of extractive uses, 50% of the area should be free of physical structures, breeding areas of important commercial fish species will be protected) should be sufficient for some sites. These can be developed into more detailed management plans (area specific, action-oriented, monitoring those actions, and making changes in the plan if those actions are not achieving results) over time. These are two different exercises and should not be confused. Many management plans combine the two with uneven results.

Whatever approach is taken, the main goals and objectives need to be set out so that managers, regulators, users and other interested parties are clear about the implications of an MPA designation. All stakeholders must have a clear understanding of exactly what conservation objectives are to be achieved and what value is to be added to the overall objective of protecting the marine environment through the designation of a specific MPA.

A management plan for each site that sets objectives, identifies issues, develops policies and management measures, and sets out how these are to be implemented, administered and evaluated will be an essential framework to guide conservation of the wildlife and habitats in offshore MPAs. The plans should incorporate provisions for monitoring and a rolling evaluation of the performance of the plan in achieving the objectives. The drafting, consultation and publication of such a plan will also make information about the MPA more easily available to interested parties and provide a focus for debate about management needs - two points which are essential to the success of MPAs.

Wherever existing plans and policies for the management of human activities have the potential to be applied (or are currently in place) to the MPA, these should be given due consideration. This will require an inventory of existing measures and an evaluation of their relevance and potential effectiveness in meeting management objectives. The inventory and evaluation will lay the basis for adopting or modifying existing measures and for the creation of any new measures that will be required. Some measures, such as catchment management plans or pollution control plans may apply to adjacent areas as well as the site itself, and others will be specific to the MPA. This inventory and evaluation process will also provide a basis for collaboration and cooperation in the establishment of a framework of protective measures for MPAs.

Consultations should be broad-based and include stakeholders as early as possible:

- Disseminate Plan to stakeholders
- Ensure the public and other stakeholders have a full and fair opportunity to share their views and concerns regarding the Plan and effectively participate at different stages of its development.
- Obtain all necessary approvals from DFO, other government departments, first nations, industry, other.
- Endeavour to resolve any objections through negotiations and alternative dispute resolution.
- Consult with international organizations such as IMO, ICAO, FAO, UNEP, regarding redirecting vessel traffic near and through the site and obtaining international designations for the proposed site, e.g.. PSSA, ATBA, World Heritage Area, etc.

The essential components of area management plans are:

- Goals and objectives of the MPA programme
- Site specific objectives
- Inventory of existing and potential uses, activities and stakeholders
- Description of the marine resources at the site
- Reasons for site selection
- Site boundary
- Inventory of existing and potential use conflicts
- Management proposals (including the identification of management bodies and regulatory requirements)
- Administrative arrangements (including funding provisions)
- Public/stakeholder involvement
- Review procedures (including schedules)

- International liaison
- Research and monitoring
- Education and interpretation

Management tools

It is important to reiterate that the broad objective in the establishment of MPAs is the management of human activities as opposed to managing the environment. Given the limitations of our understanding of the impacts of human activity on the marine ecosystem, these guidelines advocate incorporation of the precautionary approach as provided in the *Oceans Act* (Canada, 1996). A variety of methods can be used to manage activities in MPAs. Management measures may include: regulatory; non-regulatory; education; guidelines; codes of practice, *etc*. The importance of using a mix of measures, and not becoming overly reliant on the regulatory approach, cannot be over-stressed. For example, while there will be a need to establish MPAs through formal protected area designations (e.g., the *Oceans Act* or the *Canadian Wildlife Act*) a variety of educational and promotional measures are also required to encourage voluntary compliance with management objectives for each site. The distance and remoteness of many sites will necessitate reliance on more creative voluntary compliance measures as opposed to regulatory measures that may be prohibitively expensive to monitor and enforce.

The traditional starting point is to use measures specifically designed to assist nature conservation, but there is also considerable scope to use provisions relating to other sectors such as fisheries protection and safety of shipping. Management opportunities not specific to the site, such as general pollution control procedures, should also be considered. In all these examples, co-ordination with managers from other sectors is clearly essential and, as already stated, this is considered to be one of the keys to success of offshore MPAs.

a) Management systems

Introduce systems to achieve sustainable development and environmental quality by managing human activities and reducing human impacts both within the MPA and in adjacent areas. EIA becomes a recurring feature and part of a more comprehensive process (EMS).

Environmental Management Systems (EMS) are used by industry and other commercial interests to improve environmental performance. They are a formalised procedure for establishing an integrated framework for all of the inputs, outputs and processes relating to a particular operation or activity. Issues and impacts are addressed in the context of improving environmental performance.

EMS is an iterative process, moving from review, policy development, evaluation of effects, and objective and target setting through to management, operational control and audit before starting the cycle again. Environmental Impact Assessment, also widely applied in industry is one component but, in EMS, it becomes a cyclical feature rather than a 'one time event' prior to the approval of a particular procedure or activity.

The use of EMS by organisations operating in the MPA would mean that environmental considerations would be included in all aspects of the day to day and longer term management of an activity. It incorporates a commitment to continual improvement in environmental performance. The idea is already used in some offshore industries and will be particularly important in multiple-use MPAs where a variety of activities may be allowed but where there is also a need to maintain high environmental standards.

On a cautionary note, MPAs should not and cannot be expected to demonstrate effectiveness or conclusive results within the first few years of operation.

b) Zoning

Zoning schemes are applied widely in a number of areas around the world in the management of MPAs. Areas may be identified for multiple use, for specified activities with different degrees of control, or as undisturbed areas (variously described as no-take zones, refuges and fisheries reserves). Zoning has been used to establish 'control sites' for scientific study as well as core and buffer zones in Biosphere Reserves. The idea is used in offshore MPAs, most notably in the case of the Great Barrier Reef Marine Park, and as an interpretative tool for public information, as in the case of the Lundy Marine Reserve in the UK. If zoning is to be used to manage activities in offshore MPAs the following issues need to be addressed.

Relevance to offshore activities/impacts: Zoning is an area-based management tool and therefore most suited to controlling activities and associated impacts limited to geographical areas. Certain fishing activities and shipping movements come into this category and could therefore be considered under zoning schemes. If the focus of conservation action is a highly mobile species which ranges throughout the MPA, general measures which apply to the whole site may be more appropriate than zoning. To determine the best approach it will be necessary to work from the objectives for the site and to identify the main issues which need to be tackled to achieve them.

On site identification: The absence of landscape features in the open ocean and the difficulties of placing and keeping site markers in position in this environment makes it difficult to delineate the boundaries of offshore MPAs *in situ*. Emphasis will need to be placed on other ways of giving people this information such as identifying boundaries on navigation charts, in notices to mariners, and through the provision of information at departure points. General promotion will also be essential to reach others, such as those who travel to the site from remote locations, people who have no links with organisations informed about the MPA and those who may be unfamiliar with the area.

International considerations: Zoning of some of the activities taking place in offshore MPAs will require international agreement. In the case of shipping, for example, proposed routing measures and identification of environmentally sensitive areas, need to be agreed to by the International Maritime Organisation. Some aspects of fisheries management also need international agreement, even within 200m EEZs.

Zoning schemes give users a clear idea of the range of activities permitted in different areas and can be used to illustrate voluntary schemes as well as regulations. Zoning can also be used to separate incompatible activities and should not only consider types but intensity of activities as well. If used, there is a need to state that entry will not be restricted during emergencies to comply with provisions in the SOLAS convention (Safety of Life at Sea).[15]

c) Permits and Licences

Permits or licences can be used to manage the scale and type of activity in an offshore MPA. The idea is easiest to apply in situations where there is already some administrative structure. Certain fisheries could be licensed through fishermen's organisations, for example, and some forms of recreation through clubs. A system of permits or licences can bring considerable flexibility because of the opportunities for review. Licensing conditions can be modified, the scale of activity permitted under licence can be changed in response to management needs, licences can be revoked for non-compliance or, at the other end of the spectrum, the need for licences can be removed in response to changing circumstances. There is also the potential for some to be administered by organisations other than MPA managers. Existing permitting systems should be explored to see if they can be used in the MPA.

At the same time, it also needs to be recognized that some activities are simply incompatible with MPAs established for conservation. There must be a minimum standard of protection and not everything that might impact on an MPA can be regulated by permits or licences. Conservation values may dictate that certain MPAs, or zones or clusters within a multi-purpose MPA, will require a higher degree of protection whereby a no take and no waste dumping area will be delineated. In such areas, for example, no mining, no oil and gas exploration, no fishing, and no ocean waste dumping would be consistent with conservation efforts.

d) Education and Awareness

Promotion of the importance and value of MPAs, through education and awareness programs, will be an essential tool in the mix of measures used in their protection. Ultimately, volunteer compliance will be the best insurance against human induced threats since the costs of monitoring and enforcing regulations will be exacerbated by the remoteness of many sites. Education will be required at all levels, including government, industry and the general public. One of the best examples of the integration of education into the management plan of MPAs is found in the Great Barrier Reef Marine Protected Area management plan.

e) Research, Monitoring and Evaluation

Monitoring, evaluation and review are important components of the long term management of any MPA but they can be neglected because of more immediate day-to-day management pressures. The provisions and procedures to carry out this work should therefore be developed at the beginning of the programme. Information collected as part of the site selection exercise will probably be useful, but there is a need to re-examine the whole question afresh as any subsequent monitoring, evaluation and review should be designed to assist managers meet the conservation objectives of the site. In addition, the establishment of the MPA provides rich opportunities for research that will lead to a better understanding of the marine ecosystem within the actual site; the MPA itself can further serve as a control site for research activities in areas outside the MPA.

One of the key limitations in managing human activity in the marine environment is the lack of scientific certainty in data and information available on marine ecosystems. There is so much variability in natural marine systems that quantifying change is very difficult. Monitoring can be an expensive and time consuming exercise. Furthermore, due to uncertainties referenced above, there may be a need to simultaneously monitor indicators both inside and outside the MPA. Careful consideration must therefore given to what should be monitored and how the work will be carried out.

It is unlikely that any monitoring programme will be fully comprehensive; therefore those parameters which are to be recorded must be selected carefully. A combination of biological, physical and chemical parameters are usually identified for such programmes as environmental indicators (such as nitrate and phosphate inputs, a guide to levels of eutrophication). Another possibility is to identify 'quality measures'. The mix of species, or the key species, present in a particular community can be as important an indicator of its state as the area covered by that community. Quality measures can therefore give an early warning of deterioration of particular habitats and communities. Notwithstanding some of the difficulties in establishing and monitoring indicators, the effective management of MPAs is not possible without them.

f) Codes of Practice

Experience from around the world suggests that a combination of voluntary and statutory measures are useful for the management of MPAs. Regulation provides the strong backing for essential measures, while voluntary procedures try to encourage compliance. Codes of Practice are part of the latter approach and are used in MPAs. They can test management measures and if successful can avoid the need for regulation. A particularly positive aspect of Codes of Practice is that they may be drawn up jointly by users and MPA managers. This approach provides an opportunity for both parties to explain their positions and reach conclusions together. Working together to prepare Codes of Practice also makes compliance more likely.

g) Compliance and Enforcement

Enforcement of regulations is necessary for credible management of MPAs, but this does not necessarily mean a heavy-handed approach. In the offshore environment, compliance rather than regulation is likely to be the way forward. However, sanctions are necessary to serve as deterrents for violations that are likely to have serious and long-term implications. A public awareness and education programme is an essential component of any enforcement programme and is further discussed below. Both water-based and aerial surveillance are used in offshore MPAs and satellite monitoring will be useful in requiring the marking of all vessels entering MPAs to monitor and enforce compliance with protective measures.

h) Regulations

Regulations are used in MPAs as a safeguard and to establish minimum protection standards. They can be used to prevent problems, to maintain a desirable balance between different uses, to set standards, specify methods of operation and to facilitate recovery of species and of damaged and degraded environments. They must be enforced to be effective.

j) Contingency Planning

Although the emphasis of management should be on preventing problems from arising, there is also a need to be adequately prepared to respond to those problems which do occur. Contingency planning should therefore be an important management consideration and is a familiar management provision, particularly for dealing with pollution incidents.

k) Funding

As discussed in Guideline 6, it is important to develop a collaborative funding strategy for each site to achieve economies of scale, ensure commitment to the site and have the required funds to credibly implement the management plan.

Boundaries

Guideline 18: In keeping with the precautionary approach, establish (in consultation with stakeholders) preliminary boundaries as large as politically possible to meet the conservation objectives.

The identification of boundaries is an important component of the Area Management Plan. As with all aspects of the development of the Plan, stakeholder participation in the consideration of appropriate boundaries is essential. The MRCA MPA Committee should determine the preferred boundaries. Boundaries can be adjusted over time as necessary based on the objectives and the information from research, monitoring and other programs.

A great deal of discussion has occurred internationally regarding the boundaries for protected areas. The discussion breaks into two categories: appropriate size; and, methods for recognizing boundaries. The ultimate choice of boundaries will be determined based on the particular objective of an individual protected area. Nevertheless, several generalities may be made.

- The more variable the system, the larger a protected area will need to be to be biologically effective (*i.e.*, to score well on 'integrity').
- The more widely migrating the species, the more likely that smaller sites protecting key life stages (feeding, breeding, calving) will be the practical alternative. These protected areas should be supplemented by internationally-agreed conservation provisions among nations through whose water these species pass so that species are protected from harassment at all times.
- The larger the protected area, the more likely that a zoned approach (as opposed to strict 'no-take' protection) will be needed to garner public support. That being said, the 'stripe' approach and wildlife corridors are gaining favour.
- Determining appropriate size will rely heavily on the advice of experts to give their best guess. As a general rule, the precautionary approach must be employed. Where uncertainty over size exists, protected areas should be made larger rather than smaller.
- With respect to boundaries, the consensus with respect to delineating boundaries in near-shore areas is to bound the protected area by straight lines linking significant landscape features such as headlands and islands. In most offshore regions, this approach will not be possible. Solutions may include: basing boundaries on degrees and minutes of latitude and longitude; deploying transponder beacons at strategic points around the protected area perimeter; and/or, requiring vehicles transiting the protected area to carry a beacon so that their position can be monitored from shore, facilitating airborne spot checks.
- In all cases, enforcing boundaries and the provisions of management plans will be greatly facilitated by satellite communication tools.

Ultimately, the size and exact location of the offshore MPA and the level of human access and activity is a political decision based on scientific knowledge, other information and the precautionary principle, while ensuring the needs and interests of stakeholders are properly taken into account.

7. ESTABLISH OFFSHORE MPAs

Drafting MPA Regulations

Guideline 19: Draft appropriate regulation for establishment of approved Offshore MPA.

Canada must harmonize existing federal legislation and coordinate initiatives to establish offshore MPAs to ensure that legislative objectives are met. General regulations can be enacted for system-wide application as well as regulations formulated on a site by site basis. Regulations can refer to the Criminal Code of Canada for certain penalties and offences; can bestow powers on Fisheries Officers, Coast Guard, Navy, other, to monitor, surveille and enforce the regulations; set boundaries and stipulate how boundaries are reviewed and amended; determine levels of human activity permitted; zones, etc. Institutional arrangements pertaining to managing the MPA (establishment and constitution of regulating authority, authority of the management plan (over-riding powers), administration, finance, use charges can all be addressed in the site specific regulations.

Announcing Offshore MPA

Guideline 20: Governor in Council issues regulations published in the Canada Gazette designating the candidate site as an MPA.

This is a simple, cost-effective and well established procedure in Canada, familiar to many stakeholders. The regulation at a minimum should provide a general description of the Offshore MPA, and state the objectives or purpose of the site. This is considered the official announcement of the establishment of the Offshore MPA.

Guideline 21: Announce decision to establish Offshore MPA in media and notify key stakeholders and international organizations

This is an informal announcement of the official regulations appearing in the Gazette. Press releases should be sent to major media sources and notices to all key stakeholders.

8. MANAGING OFFSHORE MPAs

Appropriate, Collaborative And Timely, Adaptive Management

Guideline 22: Develop a process to ensure that stakeholders participate effectively and collaborate in the management and planning of the MPA.

- Establish a multi-stakeholder, Consultative Committee for each Offshore MPA.

- Design and develop Area Management Plan in conjunction with all relevant agencies and other stakeholders.
- Develop procedures to ensure that managers hear, accommodate and respond to stakeholder input.
- Stimulate and encourage interest and user groups to prepare strategic and management plans by providing guidelines and assistance.

Guideline 23: Coordinate Area Management Plan with adjacent land and sea area plans, activities and regulations. Coordinate planning standards and guidelines for each EEZ off each coast and between stakeholders. Identify and address inadequacies and eliminate duplication of roles.

Many of the activities will not be addressed in the Preliminary Area Management prior to designation and may take several months or years to put into place. The following are some important considerations in developing and implementing an effective Plan:

- Ensure all relevant stakeholders participate in the development of Area Management Plan to coordinate planning.
- Clarify responsibilities between agencies and implement MOUs between agencies (vessel traffic regulations, ship safety regulations, vessel source pollution controls, fishing regulations, *etc.*). These agreements are critical as co-management and partnerships are essential to the effective and efficient implementation of the MPA program.
- Have a 'one-stop-shop' for permitting of activities in the MPA and adjacent area.
- Establish formal communication mechanisms between all management agencies. Again, for effective co-management, it is critical that the lines of communication are formalized as early as possible. Respective roles, responsibilities and necessary consultations prior to making final decisions should be identified and clear.
- Ensure management strategies within the MPA are consistent with each other and are appropriate.
- Establish agreements and mechanisms for exchanging data between stakeholder agencies and organizations.
- Develop and implement appropriate coordinated management actions with other government departments, international organizations, industry, NGOs, other.
- Encourage relevant stakeholder organizations (domestic and international) to incorporate relevant objectives and strategies from this Area Management Plan into their own organizational, corporate, management or business plans.
- Manage use of Offshore MPAs and remainder of the EEZ in accordance with ecological sustainability and the precautionary principle.

- Ensure management strategies in the areas adjacent to the MPA are complementary. Standards and controls for water quality (MEQ) will be necessary to ensure the health of the ocean and prevent marine environmental degradation.

Guideline 24: Develop Strategic Management Plans designed to manage and monitor day-to-day as well as long term human activity and associated impact, based on an adaptive management approach.

- As discussed in Guideline 18, develop annual site plans, short term strategic plans and long term strategic management plans: annual plans that clearly outline specific objectives, action plan and responsible parties; short term plans (5 to 10 year) to meet the initial requirements of establishing an Offshore MPA and long term (25 year) to provide the shared vision.

- Continually update criteria for the assessment of the ecological sustainability and appropriateness of opportunities for experience and use.

- Manage all activities within Offshore MPAs from a basis of increasing knowledge about the capacity of the marine ecosystem to assimilate or recover from various levels of impact.

- Ensure levels of resource use are within evolving understanding of ecologically sustainable use, erring on the side of caution.

- Introduce Management Systems designed to improve environmental performance.

- Educate user groups and agencies about the objectives of the MPA and the Management Plan. Incorporate education strategies in management plans as appropriate.

- Develop contingency plans for mitigating the impacts of human induced disasters.

- Establish an integrated strategic marine research program to harmonize, coordinate and collaborate on data collection, analysis, monitoring and review.

- Encourage the development of ecologically benign technologies, practices and materials in activities that affect the offshore MPA and adjacent area.

- Develop comprehensive, industry-based resource management plans for all significant uses of and impacts on the MPA, consistent with ecologically sustainable use. Primary responsibility for developing these management plans rests with the relevant industry sectors.

- Develop a comprehensive strategy for long term funding from different sources to implement the Management Plan. Identify roles and responsibilities already covered within existing budgets.

- Establish a Foundation to raise and manage funds received from a variety of sources to support the research, monitoring, education programs and management of the Offshore MPA.

Public Participation, Education And Outreach

Guideline 25: Build a broad-based constituency to understand and support the objectives of the MPA program and Area Management Plan

It is a well recognized feature of coastal zone management and MPA programmes that a broad-based educated and supportive constituency is vital to the success of these efforts. The experience with MPAs in Australia and New Zealand is testament to constituency-building.

Guideline 26: Develop coordinated formal and informal education, information, media, extension and interpretive programs and materials for diverse, target groups

Education and knowledge of MPAs leads to increased awareness, understanding and enjoyment of the natural environment. MPAs are 'living underwater laboratories' where visitors can experience the complexity and fragility of the marine environment. Offshore MPAs may not be as accessible as coastal counterparts, but with modern technology, *in situ* experiences are still possible. The Monterey Bay Marine Sanctuary has an offshore video uplink that brings the ocean to life for its visitors. Swath imagery of the ocean floor is an impressive technique used by geologists at the Atlantic Geoscience Centre. Vivid colour images depict mountains and wonderful terrain below the surface. Historic shipwrecks are visible and can be toured from the comfort of your computer at home or school with the assistance of the internet.

General public education programs: pamphlets, videos, posters, displays, talks, television programmes, radio programmes and other media features, play an important role in educating the public and other target groups about MPAs and why they are important. It is also essential to develop a variety of other programs targeted at different agencies, users, school children, etc. Beginning at pre-school is not too soon. Such education will help to ascribe worth to the sustainability of natural resources and the need to carefully manage human activity. Attitudinal change, custodianship and compliance can only occur with such education and experience. Education about sustainable development and the marine environment must be included in the curriculum at all levels in public schools in the region.

Canada should develop coordinated education and extension programs targeting specific groups (including user groups within the MPA and in adjacent areas) and/or issues to be developed and implemented by appropriate stakeholders. Care must be given to ensure that culturally appropriate regulatory and informative material is prepared for all stakeholders. Increasing all stakeholders' understanding and commitment to ecologically sustainable use of the EEZ will positively influence the attitudes, knowledge, and behavior of user groups, the formal education sector, and the broader general community.

The education, extension, media and public relations programme created for the MPA programme should be integrated with broader public education, public school curriculum and information strategies, e.g. Oceans Day, Earth Day, Environment Week, maritime studies, environmental sciences, etc.

The Great Barrier Reef Marine Park allocates a significant percentage of their budget to public education (GBRMPA, 1996), with the slogan "Education for all -- use without abuse." New

Zealand also dedicates a large percentage to public education and educating school children about the need for MPAs (Ballantine, 1995; Wolfenden *et al.*, 1994). These efforts have resulted in public support for management activities and increased compliance. These models deployed a variety of methods and media to target a wide range of existing and potential users, young and old. Appropriations must be secured to ensure that this aspect of the MPA programme is implemented.

Compliance/Enforcement

Guideline 27: Develop, monitor and evaluate, in consultation with stakeholders, an integrated compliance strategy

- Foster development of stakeholder-generated codes of behavior/practice and MOUs as an adjunct to legislation.
- Inform and educate stakeholders of the underlying policies and legislation relevant to the offshore MPA.
- Monitor public and other stakeholder behaviour in the MPA and evaluate methods to promote compliance.
- Ensure enforcement is available and effective, supported by significant penalties to protect conservation values of MPA and deter violations.
- Ensure legislation and other practices that minimize the cost of enforcement while providing sufficient deterrents.

Dispute Resolution

Guideline 28: Develop effective, open, alternative dispute resolution mechanisms, including mediation, conciliation and specialist technical panels, to resolve disputes quickly and inexpensively, yet fairly.

- Facilitate conflict resolution between user groups.
- Develop mechanisms for exchanging ideas between different groups and gaining respect for each other's values.
- Develop a range of cost effective and non-adversarial methods of resolving disputes between users and the MRCA MPA Committee.
- Establish a specialist panel to professionally, fairly and promptly resolve contested issues. The MRCA should recommend a pool of individuals who would be selected as tribunal members and appointed on a case-by-case basis.

9. RESEARCH, MONITORING AND REVIEW OF OFFSHORE MPAs

Guideline 29: Develop integrated research and monitoring program in conjunction with stakeholders for MPAs linked to other activities in the region. Use research and monitoring data in the development, implementation and evaluation of proposals, management plans, zoning plans, resource usage and impacts.

Monitoring programmes in MPAs are usually used to alert managers to potential problems and gauge the success of management provisions. When a feedback component is included it ensures there is a clear link between monitoring and management.

Feedback monitoring was used during the construction of the largest bridge in Europe linking Denmark and Sweden, based on the environmental predictions made in the EIA and included a statistically testable hypothesis. The feedback loop was based on oxygen levels; if oxygen fell below a certain level, surveys would automatically be initiated and work suspended.[16] The same approach has been used by the Norwegian Government in relation to monitoring of offshore oil and gas fields (Gray, 1995).[17] Such monitoring leads to higher environmental standards and improved environmental conditions. Companies operating offshore under this regime will take additional care to ensure that predications made in EIAs are accurate, testable and conservative.

- A formal review and evaluation process should be an integral part of the management of the MPA. This needs to inform all aspects of the management of MPAs, from success of management policies and procedures, to the administration arrangements for putting MPAs into place.
- Monitor to determine ecological changes occurring after establishment of the MPA and the factors contributing to such changes.
- Monitor the applicability and effectiveness of new technologies
- Monitor and evaluate the participation of stakeholders in the management and planning of offshore MPAs.
- Establish methods for timely review of research and monitoring. How do you determine effectiveness? What time scale should be used?
- Conduct a major review of the management plan every six years and adjust as necessary.

Appendix 1: Sections 35 and 36 of the *Oceans Act*

Section	Objective	Criteria of greatest significance in area selection *(Sites do not have to fulfill all criteria set out in each section)*
35 (a)[18]	the conservation and protection of commercial and non-commercial fishery resources, including marine mammals, and their habitats **(protection of functionally critical sites)**	- would contain nursery or juvenile areas. - would contain feeding, breeding or rest areas. - contribute to economic value by virtue of its protection (*e.g.*: recreation, subsistence, use by traditional inhabitants, appreciation by tourists and others, serving as a refuge nursery area or source of economically important species). - lead to potential economic loss by failure to provide protection.
35 (a)	the conservation and protection of commercial and non-commercial fishery resources, including marine mammals, and their habitats[19] **(reservoirs for recruitment)**	- contain an essential part of ecological processes or life-support systems (for example, a spawning area crucial to the supply of larvae in downstream areas). - contribute to economic value by virtue of its protection (*e.g.*: recreation, subsistence, use by traditional inhabitants, appreciation by tourists and others, serving as a refuge nursery area or source of economically important species). - lead to potential economic loss by failure to provide protection.
35 (b)	the conservation and protection of endangered and or threatened marine species and their habitats[20]	- contain an essential part of ecological processes or life-support systems (for example, a spawning area crucial to the supply of larvae in downstream areas). - would contain habitat for rare or endangered species (either relict populations or 'edge range' populations). - would contain nursery or juvenile areas. - would contain feeding, breeding or rest areas. - would contain rare or unique habitat for any species.
35 (c)	the conservation and protection of unique habitats	- contain rare biogeographic qualities. - would contain unique or unusual geological features. - would contain rare or unique habitat for any species. - would provide existing or potential value because of its heritage, historical, cultural, traditional, aesthetic, educational, or recreational qualities.

Section	Objective	**Criteria of greatest significance in area selection** ***(Sites do not have to fulfill all criteria set out in each section)***
35 (d)	the conservation and protection of marine areas of high biodiversity or biological productivity	• contain an essential part of ecological processes or life-support systems. • would, either by itself or in association with other protected areas, encompass a complete ecosystem or a large percentage of a complete ecosystem. • would contain a wide variety of habitats. • would contain a high degree of genetic or species diversity or productivity.
35 (e)	the conservation and protection of any other marine resource or habitat as is necessary to fulfill the mandate of the Minister	• have been well protected from, or had not been subject to, human-induced change. • be representative of a biogeographic 'type' or types. • be a good candidate for remediation to a near-natural state. • would be of high value for research and monitoring. • have the potential to be listed on the World (or national) Heritage List. • have the potential to be declared a Biosphere Reserve. • have the potential to be included on a list of areas of international or national importance. • is the subject of an international or national conservation agreement. • is the subject of potential threat
36 (1)	...the Minister, may make orders exercising any power under section 35 on an emergency basis...	• contain rare biogeographic qualities. • would contain unique or unusual geological features. • would contain habitat for rare or endangered species. • would contain rare or unique habitat for any species. • contribute to economic value by virtue of its protection. • would provide existing or potential value to the local, national or international communities because of its heritage, historical, cultural, traditional, aesthetic, educational, or recreational qualities.

C. INTERNATIONAL OVERVIEW OF MARINE PROTECTED AREAS

THE BIOSPHERE RESERVE MODEL

ISSUES	DESCRIPTION
Objectives	The overall long-term objective of the biosphere reserve program is to establish a global network of representative areas that fill the following three roles: a) conservation of biodiversity; b) logistical support for research, environmental monitoring, education and training; c) demonstration areas for ecologically sustainable resource and land use. Given the flexibility of the concept, more specific objectives will depend on the individual reserve.
Area evaluation method	The reserve area should ideally encompass an entire ecological unit and be divided into zones characterized by differing intensities of human use. Core areas provide strict conservation and are surrounded by buffer and transition zones where human use is allowed but regulated.
Site selection criteria	Biosphere reserve sites are selected based on representativeness, naturalness, biological diversity, and/or effectiveness as a conservation unit. Each site must represent at least one typical ecosystem of the biogeographical area. It should be large enough to sustain viable populations and it must have a core area(s) component which is minimally disturbed. Each reserve is required to provide facilities for scientific research and environmental monitoring. Most importantly, the area must be guaranteed long-term legal protection. The management authority of a biosphere reserve must be willing to encourage local participation and provide public education and training. Finally, biosphere reserves are to contain as many as possible of the following areas: natural centers of endemism; areas of rich biodiversity; unique features; areas suitable for scientific manipulation; examples of traditional patterns of sustainable land use; and modified or degraded ecosystems suitable for restoration.
Information gathering & management	Standardized environmental information is to be shared via an international communication network between and among all biosphere reserves and other MAB programs. Communication includes: shared technology and information; development and coordination of comparative monitoring and research projects; and exchange and training of specialists. Information about the ecosystem is required prior to designation to determine the boundaries for the core, buffer, and transition zones. Additional information may later modify those boundaries.
Stakeholder consultations	All stakeholders must come to a consensus in order to establish a biosphere reserve. In addition, the administration and management of individual reserves work with local people and organizations in and around the reserve boundaries and should have a willingness to include local people in decision making.

ISSUES	DESCRIPTION
Area establishment	Normally there is no need for changes in land holdings or regulations except to ensure strict protection of core areas or specific research sites. Tend to be larger than other parks. Biosphere reserves are often established around an area already protected. In fact, the designation of many biosphere reserves has not included any additional land. These reserves may consist of clusters of areas when a contiguous protected area is not possible.
Lead agency	The International Co-ordinating Council of the UNESCO Man and the Biosphere (MAB) Programme designates biosphere reserves on the basis of nominations sent in by national MAB committees. These committees work with the national, provincial and local agencies. Initiatives to nominate an area can come from any government agency or private organization that is active and known in nature conservation and resource management.
Management measures	Biosphere reserves are to be managed on the basis of sustainable development using a multiple-zoning method. Use of the core area(s) is very restricted, whereas the buffer and transition (or 'area of cooperation') zones can be managed in a variety of ways so long as they don't impact in the core area(s). Examples of allowed human activities include: scientific experimentation; ecosystem restoration; cooperative management of agricultural activities, settlements, etc.
Community involvement	This is a key factor in all phases of establishment and management of biosphere reserves.
Research requirements and activities	Scientific research and environmental monitoring are required and all biosphere reserves must provide facilities for such work. Emphasis is on baseline studies and their value as benchmarks for long-term measurements of change. The four research orientations are: ecosystem functioning under different intensities of human impact; management and restoration of human-impacted resources; human investments and resource use (link between economies, human welfare, and ecological sustainability), and; human response to environmental stress. All involve a human component, but the specific research program will depend on the area.
Legal mechanisms	Although any area designated as a biosphere reserve must have long-term legal protection, the nature of that protection is determined by the individual states, regions, or reserves.
Monitoring	Required in all biosphere reserves. Transmission of results is an integral part of the concept. How humans affect the ecosystem is addressed through the monitoring program.

ISSUES	DESCRIPTION
Public Education and Constituency Building	In this program there is a strong emphasis on education and training. Biosphere reserves are to serve as centres for education and training for scientists, resource managers, protected area administrators, visitors, and local people. Activities encouraged include: academic and professional training; environmental education; demonstration and extension programs; and training for local people supplemented by provision of employment opportunities.
Socio-economic benefits	A fundamental objective of the MAB Programme is to research solutions to problems related to resource use; this includes socio-economic problems. Because biosphere reserves often include traditional land use systems, they help to foster pride in local traditions. The reserves also provide a basis for improving means of livelihood through prudent use of science and technology in ways which respect traditions. Ideally, benefits from the reserve should radiate into the surrounding area.
Funding	Funding is available for the planning stage of reserve establishment.

Summary

UNESCO's Man and the Biosphere Program was launched in 1971 and at the first meeting of the International Coordinating Council, which supervises the MAB Programme, the theme of the program was decided upon; "conservation of natural areas and the genetic material they contain." The first biosphere reserve was established in 1976 and since then over 500 reserves have been designated. When created, this program was quite innovative because of its complementary components of conservation, logistical support, and sustainable development. Several elements of the program are considered quite novel, including the global communication network, and the combination of nature conservation, scientific research, local participation and sustainable resource use.

Although the conceptual framework for biosphere reserves is exemplary, its actualization has proven difficult on several fronts. During the first ten years of the program, a plethora of biosphere reserves were designated. However, the majority of these areas were already protected in one form or another and therefore the designations added little to existing protection. Another criticism of the program in its early years was its overwhelming focus on conservation. To a large extent, the logistic and development aspects of the program were forgotten. In response to these problems, UNESCO, FAO, IUCN, and UNEP joined together in the First International Biosphere Reserve Congress held in Minsk, USSR in 1983. From this meeting the 1984 Action Plan for Biosphere Reserves was established to help further develop the biosphere reserve program along the original model objectives. Still, many experts feel that today's biosphere reserve program needs a stronger scientific research component. The global communication network is also seen as lacking in many ways. Nonetheless, the biosphere reserve model is praised for its integration of conservation, education and development and is touted as an excellent model for protected areas in general and especially suited to marine protected areas. Its enormous flexibility allows for a management regime appropriate to the area.

Applicability to Offshore MPAs

The biosphere reserve model has been given a lot of attention in the MPA literature. The consensus among experts in the field seems to be that with some alterations to the concept, it can be well suited to the selection and design of MPAs (See Agardy, 1997; Brunckhorst, 1994; Kenchington and Agardy, 1990). The principal difficulty in applying the biosphere reserve model to marine ecosystems is the provision of representativeness. An objective of the model is for the core area of a reserve to encompass an entire ecological unit, thus providing the resources necessary for the support of all life stages of species. Because of the fluid nature of the marine environment, an ecological unit may be several hundred kilometers or more. It is generally thought that this problem of scale can be overcome by using a cluster approach to protection of marine systems. The use of clusters of protected areas where a contiguous area is not feasible, was accepted by the MAB International Coordinating Council as far back as 1977. Because the biosphere reserve program focuses on sustainable resource use, some offshore MPAs not subject to commercial extraction may not qualify. In addition, the large scale offshore commercial fishing, characteristic of many of Canada's offshore waters, may not be an appropriate activity for a sustainable model. It is difficult to imagine a biosphere reserve in the offshore but many experts consider it an ideal way to manage coastal regions in an integrated manner (Agardy, 1997). Nonetheless, there is great interest and discussion of marine biosphere reserves as well as the use of the biosphere reserve concept in the establishment of a variety of MPAs.

Literature Sources

Agardy, T. S. 1990. Draft guidelines for biosphere reserve planning. In R. Graham (ed.) *Marine Ecological Areas In Canada,* Canadian Council on Ecological Areas, Ottawa, pp. 45-62.

Agardy, T. S. 1997. *Marine Protected Areas and Ocean Conservation.* Georgetown, Texas: R. G. Landes Company and Academic Press, Inc.

Batisse, M. 1982. The Biosphere Reserve: A tool for environmental conservation and management. *Environmental Conservation* 9(2), pp. 101-111.

Batisse, M. 1986. Developing and focusing the biosphere reserve concept. *Nature and Resources* 22(3), pp. 2-11.

Brunckhorst, D.J. (ed.) 1994. *Marine Protected Areas and Biosphere Reserves: 'Towards a New Paradigm'.* Proceedings of a workshop hosted by the Australian Nature Conservation Agency and supported by UNESCO. An Australian Nature Conservancy publication, Canberra, 98 pp.

Brunckhorst, D.J. and Bridgewater, P. B. 1994. A novel approach to identify and select core reserve areas, and to apply UNESCO Biosphere Reserve principles to the coastal marine realm. pp. 12-17 in Brunckhorst (1994).

Clark, J. 1992. *Integrated Management of Coastal Zones.* FAO Fisheries Technical Paper 327. FAO, Rome, p. 153.

Dyer, M.I. and Holland, M.M. 1991. The Biosphere-Reserve Concept: Needs for a network design. *Bioscience* 41(5), pp. 319-325.

IUCN/UNEP/WWF. 1980. *A Strategy for World Conservation* IUCN/UNEP/WWF. Gland. Switzerland.

Kenchington, R. and Agardy T. 1990. Achieving marine conservation through Biosphere Reserve planning and management. *Environmental Conservation.* 17(1), pp. 39-44.

Kenchington, R. *et al.*, 1990. 'Marine Conservation and Biosphere Reserves'. In R. Graham, ed., *Marine Ecological Areas In Canada,* Canadian Council on Ecological Areas, Ottawa, pp. 93-113.

UNESCO. 1971. *International Co-ordinating Council for the Programme on Man and the Biosphere.* MAB Report Series, No. 2, 65 pp.

UNESCO. 1974. *Task Force on Criteria and Guidelines for the Choice and Establishment of Biosphere Reserves.* MAB Report Series, No. 2, 61 pp.

UNESCO. 1984. Action plan for biosphere reserves. *Nature and Resources.* 20(4), pp. 11-22.

UNESCO. 1987. *A practical Guide to MAB.*

UNESCO. 1990. *Biosphere Reserves.* Canada/MAB Secretariat, Ottawa. 11 pp.

Internet:

Man and the Biosphere Homepage
<http://www.unesco.org/mab/home/home/htm>

WORLD HERITAGE SITES (NATURAL AREAS)

ISSUE	DESCRIPTION
Objectives	To protect the natural areas of the world which are of outstanding universal value; To provide information for world wide public enlightenment; To provide for research and environmental monitoring.
Area evaluation method	The IUCN is responsible for the expert evaluation of each proposed Natural World Heritage Site. The sites are evaluated in comparison to sites of the same type which are within the bigeographic province or migratory pattern (within or outside the host state's borders).
Site selection criteria	Natural sites must represent one or more of the following criteria: (i) be outstanding examples representing the major stages of the earth's evolutionary history. (Sites should contain all or most of key interrelated and interdependent elements). (ii) be outstanding examples representing significant ongoing geological processes, biological evolution and our interaction with the environment. (Sites must be of sufficient size, contain necessary elements to demonstrate key aspects of the process and to be self perpetuating). (iii) contain unique, rare or superlative natural phenomena, formations or features or areas of exceptional natural beauty. (Contain those ecosystem components required for continuity of the species or objects to be conserved). (iv) be habitats where populations of rare or endangered plants and animals still survive. (Be of sufficient size and contain necessary habitat requirements for survival of species; in the case of migratory species, sites must protect seasonal areas necessary for survival and the committee must receive assurance that measures are taken to adequately protect the full lifecycle).
Information gathering & management	Recently, the World Heritage Committee has made a priority objective to invest in an information and management documentation system which uses advanced technologies.
Area establishment	Potential sites are nominated by the nations within whose territories they lie The World Heritage committee identifies those which should be added to the list.
Lead agency	The World Heritage Committee undertakes the measures necessary to implement the convention. The committee is made up of a representative from each of the 21 states party to the convention. Responsibilities of the committee include: the identification of world heritage, informing the public, and providing assistance from the World Heritage Fund to states with insufficient financial resources.

ISSUE	DESCRIPTION
Management measures	The primary focus of management is maintaining integrity. Some sites are of such significance that public use is either strictly controlled or prohibited.
Community involvement	It is possible for local communities to nominate sites for government to take forward. (This is being done in the UK in the case of the Dorset coastline).
Legal mechanisms	The International Convention for the Protection of World Cultural and Natural Heritage ("The World Heritage Convention") was adopted by the general conference of UNESCO in 1972 and came into force in December of 1975. The Convention provides a permanent legal, administrative, and financial framework for the protection of natural and cultural sites of universal significance to humanity. The basic philosophy of the program is that world heritage transcends all political and geographic boundaries. All sites have strict legal protection and are owned for the long-term by government, non-profit or trust.
Monitoring	Systematic on site monitoring and reporting is primarily the responsibility of the state parties. Each year conditions of a site must be recorded by the site manager or management authority. The conservation status of existing sites is monitored primarily for the detection of loss of integrity. Emergency measures may be enlisted to save a deteriorating site or else if it has lost integrity a site may be delisted.
Review and evaluation	Every 5 years, each state gives a report to the World Heritage Committee on the state of the World Heritage sites in their territory. At this time the Committee reviews the status of these sites.
Public education/ constituency-building	An important objective of the program is to educate the public on the value of preserving the world's natural and cultural heritage. The program also promotes the idea to communities, organizations, institutions and non party states in order to increase the number of participating states and to acquire further financial support. In addition, the World Heritage Centre in Paris develops teaching materials to raise the awareness of the world heritage concept.

ISSUE	DESCRIPTION
Funding	The World Heritage Fund is financed by mandatory or voluntary contributions from state parties and contributions by other states, private organizations and individuals. The Fund also organizes national and international fundraising campaigns. Funding goes to states who need assistance protecting their World Heritage Sites or to meet urgent conservation needs of properties on the List of World Heritage in Danger. The types of technical assistance covered by the Fund include: emergency measures to save a property in immediate danger of deterioration or total destruction; preparatory assistance in drawing up nominations to the World Heritage List and requests for technical co-operation; and projects which are likely to have multiplier effects ('seed money'). As a general rule the international community is responsible for only part of the cost. The nation with primary responsibility must make a substantive contribution of resources devoted to each program unless such resources are not available. The Fund also considers debt swaps for world conservation.

Summary

At the 1992 World Heritage committee meeting, several new program objectives were established, including striving for more of a balance between natural and cultural heritage sites as well as working towards universal representation.

Of the over 350 designated World Heritage Sites, only 25% are sites of natural heritage, whereas the rest protect cultural heritage. In addition, there are many party states which do not have any designated sites, and many other nations which are not yet party to the convention. The Committee is working towards expanding the list to include sites in all countries of the world.

Also at the 1992 meeting, new criteria for the selection of natural sites were proposed. These stressed sites of exceptional biodiversity rather than habitats of endangered species and removed the references to 'man' and 'culture' present in the existing site selection criteria. Although the overwhelming experience of World Heritage is in preserving cultural resources, the concept and management of the program can be instructive for those designing MPA systems.

Applicability to Offshore MPAs

World Heritage sites are extremely diverse in their make up, administration and management. There are some examples of aquatic and marine sites which may be instructive in designing an MPA system:

- The Great Barrier Reef Marine Park.

- Lake Malawi National Park is 94 km^2 and includes four mainland areas, two islands and 7 km^2 of water.
- Lake Ichkeul in Tunisia is an important refuge for migratory water fowl.
- Sian Ka'an Biosphere Reserve on Mexico's Yucatan peninsula includes tropical forests, coral reefs and mangrove areas. Lobster fishing, agriculture and the gathering of traditional plants for medicines are some of the regulated activities with in the site.

The World Heritage Convention protects sites of extraordinary significance or uniqueness. There are unique offshore habitats and physical formations which would benefit from protection, such as hydrothermal vents or deep canyons which tend to have a high degree of endemism and provide important seasonal habitats to some species. The preservation of highly significant areas coupled with the creation of a system of representative protected areas would together form a well balanced network of conservation. There is considerable potential for some offshore areas to receive World Heritage status as there have been few proposals relating to the offshore environment in the past.

Literature Sources

Glissant, E. (ed.) 1988. An idea in action: The World Heritage Convention and how it works. *The Courier.* August, pp.34-38.

Jolly, A. 1988. The World's Wild Places. *The Courier.* August, pp. 5-11.

Nelson, J.G. and Alder, E.A. (eds.) 1993. *Towards a Greater Understanding and Use of The World Heritage Convention.* Occasional Paper #22. Heritage resource centre, University of Waterloo. Waterloo, Ontario. 116 pp.

UNESCO. 1980. *The World Heritage Convention.* Paris, France. 24 pp.

UNESCO. 1981. *Convention concerning the protection of the World Cultural and Natural Heritage: Adopted by the General Conference at its 17th session.* 16 November, 1972. Paris.

UNESCO. 1982. *A legacy for all the world: The world's major natural, cultural and historic sites.* UNESCO, Italy.

UNESCO. 1996. *Operational Guidelines for the Implementation of the World Heritage Convention.* <http://www.unesco.org/whc/>

Internet

UNESCO World Heritage Site Homepage
<http://www.unesco.org/index.html>

GREAT BARRIER REEF MARINE PARK

ISSUE	DESCRIPTION
Objectives	The goal of GBRMPA is to provide for the protection, wise use, understanding and enjoyment of the Great Barrier Reef through the care and development of the GBRMP. Subordinate aims relate to conservation and reasonable use, community involvement, research, provision for economic development consistent with ecologically sustainable use, integrated management, community commitment, recognition of traditional uses and rights, efficiency, minimal regulation, employment of high calibre staff, making expertise externally available and adaptive management.
Site selection	GBRMP was established in 1975 largely in response to public pressure and concern about mineral and oil exploration on the GBR. The GBR was inscribed on the World Heritage List in 1981, in recognition of its status as the largest coral reef system in the world, supporting the most diverse biological ecosystem known to man, providing some of the most spectacular scenery on earth and of exceptional natural beauty. Part of the GBRMP is designated as a Particularly Sensitive Sea Area by the International Maritime organisation. 95% of the GBRMP meets the definition of IUCN category IV and V protected area - the remaining 5% lies within the more highly protected zones within the MPA (category I and II).
Legal mechanisms	*Great Barrier Reef Marine Park Act*, 1975 (including subsequent amendments) establishes the Authority and defines its functions. This is the basis under which all actions by the Authority are taken. The Act may prevail over all other legislation (except aspects of the *Navigation Act*), and confers the Authority with overriding powers (not yet invoked but of assistance in negotiations). The Act includes provisions relating to: establishment and constitution of the Authority; the GBR Consultative Committee, definition and basis for management of the GBRMP, an environmental management charge, plans of management; enforcement; finance; compulsory pilotage; and miscellaneous other matters. Zoning is an important feature established by the legislation. Certain activities are prohibited throughout the marine park, including mining, spear-fishing, using SCUBA and commercial spear fishing, and drilling. Other activities may require a permit (se Management Measures). A 1995 amendment provides for a use charge (Part VA) and statutory management plans for designated areas.
Monitoring	The aim of the Authority's long-term monitoring program is to provide information to managers on resource status and effectiveness of management. This program in the short-term monitors water quality, crown-of-thorns, coral bleaching, and effects of fisheries.

ISSUE	DESCRIPTION
Community involvement	The GBRMP Act requires two-stage public involvement in the preparation of zoning and statutory management plans. The Authority recognizes that effective implementation of its management programs requires direct community contact to generate support and commitment. Regional Marine Resource Advisory Committees (RMRAC) were established to provide additional opportunities for local decision-making for use of the reef. As well, legislation provides for a GBR Consultative Committee, which represents the major interest groups with half its membership nominated by the Queensland state government. As a result, GBRMPA undertakes extensive consultation with the public at all levels through formal and informal mechanisms.
Research requirement and activities	To expand the information available for decision-making, GBRMPA's Research and Monitoring section provides design, direction and coordination services for external research contractors. In designing and carrying out these programs, the Authority works closely with other agencies, especially the Australian Institute of Marine Science (AIMS) and the GBR Cooperative Research Centre. The information this generates is vital to support management of the MPA and to ensure that decision-making processes are effective, open and accountable. Whilst GBRMPA is the lead agency, management of the Park is generally viewed as a joint Federal and State government responsibility. Day-to-day management is undertaken by State (Queensland) agencies, particularly the Department of Environment. Major programs include crown-of-thorns starfish and other large-scale ecological impacts, socio-cultural and economic research, effects of fishing and water quality. This emphasis on cooperative design and implementation aims to ensure that research is directed at specific questions or goals and thus most likely to generate information which is useful to planning and management.
Lead agency	A single, independent agency is responsible for planning, coordination and overall management. The GBRMPA has over-riding planning and management functions and is an independent agency responsible for reconciling and managing all interests. The section participates in internal and external committees to optimize input into decision making and liases with government, planners, managers, scientists, industry representatives and the general public. Because the MP is multiple-use, the Authority must consider all legitimate users and interest groups, and have adopted an interdisciplinary, non-sectoral approach.

ISSUE	DESCRIPTION
Multi-sectoral partnerships	The state is a formal agent for complementary management between Commonwealth and adjacent state waters (see below under co-management). In addition, cooperative management arrangements are being developed with Aboriginal communities. Cooperative research programs have been established to focus on the big issues in the region that interest agencies and industry groups in the region, including water quality and effects of fishing. In 1994 the GBRMPA, in cooperation with over 60 stakeholder organizations, released a 25-year Strategic Plan for the GBR World Heritage Area (GBRWHA). The plan outlines a 25 year vision for the GBRWHA and sets out the long- and short-term objectives and strategies required to realize that vision. These were developed through an extensive consultative process stretching over 3 years involving joint decision-making by the many organizations involved. The Director General of the IUCN, Mr. David McDowell, identified the plan as a model and a demonstration of strategic planning for natural resources management.
Management measures	GBRMP is divided into 4 sections. Each section has a statutory zoning plan. These zoning plans indicate legislated activities ('as of right') and those activities requiring a permit consistent with the zone. The zoning plans identify what activities can be undertaken in a given spatial area. The Authority is also able to employ restrictions on equipment such as the general ban on spearfishing on SCUBA. The permits system allows case-by-case consideration of aspects not directly covered in zoning plans, including management of the extent of use and impact (including EIA procedures). Various site-specific management plans can be designated to deal with high use areas or urgent or priority issues (*e.g.* dugong management). These can provide the basis for temporal controls such as seasonal closures or short-term controls. This case-by-case approach has become unwieldy, hence the Authority has introduced site-specific management plans.

Co-management	Management of the GBRMP is conducted in cooperation with the Queensland state government which has jurisdiction over most GBR islands, all waters within Queensland jurisdiction and the adjacent mainland (a few islands with lighthouse are Commonwealth lands). One of the four statutory members of the GBRMP Authority is nominated by Queensland; a second is an Aboriginal Torres Strait Islander representative. The GBR Ministerial Council includes representatives of both Commonwealth and state ministers, allowing close involvement of the state government and assist in integrating management of islands and waters. Queensland authorities undertake day-to-day management of the GBRMP which has led to complementary zoning plans and management with adjacent areas under Queensland jurisdiction. Most fisheries management is also undertaken by relevant state agency. The Authority seeks to co-operate with other organizations with an interest in the GBR and has entered into a large number of agreements on matters concerning management, research, surveillance, and fisheries.

ISSUE	DESCRIPTION
Enforcement	Strong emphasis is placed on the encouragement of responsible behaviour, through education and awareness programmes. This cannot prevent infringement of regulations, and enforcement is required although is difficult given the scale of the GBRMPA. Surveillance is undertaken by both water and airborne patrols. Enforcement is undertaken by bodies such as the Queensland Department of Environment, Queensland Boating & Fisheries Patrol, and Coastwatch. Methods include observation, boarding of vessels in port, and inspection of walking tracks on islands. Compulsory pilotage is in force in the designated shipping channels.
Public education/ Constituency building	GBRMPA's Education/Information section and Public Affairs unit aims to increase understanding World Heritage values, promote responsible behaviour and achieve greater stakeholder input into planning and management. A wide variety of extension and training programs have been developed to achieve these objectives and are supported by the production of information materials and active public affairs and media programs. These activities target major stakeholders such as the tourism and fisheries industries, coastal communities and the general public.
Review and evaluation	GBRMPA compiles an annual report detailing progress and achievements, financial reports, sources of funds and activities undertaken by each of its sections (planning and environmental management; education and aquarium, research and monitoring, Canberra office, external services and corporate services). The Authority prepares 'State of the Reef Reports' at regular intervals.
Feedback mechanisms/ remedial efforts	Numerous mechanisms exist to adopt and respond to public concerns as well as to technological, social and political factors. This is realized through the zoning process and part of the permits system which provides a mechanism for case-by-case consideration of activities likely to have an impact on the structure/process/amenity of the Park. The Consultative Committee includes representatives of major interest groups and provides advice to GBRMPA on the conduct of its programs. The RMRAC are an effective mechanism to exchange information and effect change.
Stakeholders consultations	See above under community involvement.
Socio-economic benefits	Providing for reasonable use is one of the express aims of the GBRMP. Management of the area has significant benefits to tourism, fishing and conservation. Revenue from tourism and fisheries activities in the region generates close to $1 billion annually to the Australian economy.

ISSUE	DESCRIPTION
Funding	In 1995/96 the total operating costs of the GBRMPA were approximately AUD 26.7 million. The major elements of this were research and monitoring (3.9 million), planning and environmental management (4.7 million), education and information (2.4 million), the GBR Aquarium (2.0 million), external services (1.6 million), corporate management and services (1.9 million) and payments to Queensland for day-to-day management (8.6 million). Major sources of independent operating revenue included the contribution of the Queensland state government towards day-to-day management (4.0 million), the GBR Aquarium (1.6 million), and miscellaneous revenue including external services, permit assessment fees, interest and other items (3.0 million). The net cost of services after this revenue is deducted from operating costs was approximately 18 million. These expenses were largely met from Commonwealth government appropriations. This appropriation includes a contribution of around 1.5 million towards recovery of costs from the Environmental Management Charge (EMC). The EMC was introduced by the Commonwealth government in 1993 with the objective of recovering part of the increasing management, research and education costs associated with a marked increase in use of the Marine Park. In the future, the EMC will be used as a means of recovering an increasing proportion of the costs of managing the GBRMP.

Summary

The Great Barrier Reef is the world's largest coral reef system, the world's largest World Heritage Area, and the marine park which encompasses it is probably the best known MPA in the world. The Great Barrier Reef Marine Park was established in 1975. It includes 2,900 separate coral reefs which comprise almost all of the Great Barrier Reef coral systems. The Park and covers 344,000 sq. km., making this reserve the largest MPA established to date. In 1981 the area was designated a World Heritage Site containing the GBRMP, Queensland State Marine Parks, and incorporates all islands including Island National Park. The management of GBRMP, adjoining, is carried out by the GBRMP Authority which is under the federal government. The GBRMP represents an example of the use of functional zonation in an MPA. A diverse array of activities are conducted in the park including, tourism, scientific research, fishing and shipping. The protection afforded to each zone varies from no human impact to allowance of the full range of activities described above. GBRMPA is recognized as a world leader in the management of MPAs.

Applicability to Offshore MPAs

The operation of the GBR Marine Park illustrates both the difficulties and possibilities of designating large areas of sea as MPAs. The potential of zoning has been tried and tested in this MPA and strengths and weaknesses recognized. GBRMPA are leaders in this field and their experience has informed the application of zoning schemes in MPAs in other parts of the world. The value of using zoning as a 'user friendly' way of presenting information about park management to huge numbers of visitors is also interesting and a useful model for elsewhere.

Another message from the GBRMP is that it is possible and advantageous to seek support from the international community for the management of offshore MPAs. Over the years the park has received not only World Heritage Status but also the northern section has been identified by the International Maritime Organisation as a Particularly Sensitive Sea Area. These have brought international recognition (which can help progress at a national level) as well as practical support for management (as in the case of the pilotage requirements under definition as a PSSA).

The size of the park confirms the difficulties of enforcement in this type of situation, something which is likely to be a feature of other offshore MPAs. In the case of the GBRMPA a great deal of effort has therefore been put into raising public awareness and education about the park and the need for its management. It is clear that this approach needs to be applied to offshore MPAs even though they may be remote from population centres.

The involvement of both state and federal authorities is critical to making the park work in practice. The use of Memoranda of Understanding or Concordats between groups who need to collaborate for successful management of such areas is a useful approach. On the ground, the use of community wardens is a way of improving local support and involvement in the Park.

Literature Sources

Craik, W. 1992. The Great Barrier Reef Marine Park: its establishment, development and current status. *Marine Pollution Bulletin.* 25(5-8), pp. 122-133.

Geen, G. & Lal, Padma 1991 *Charging users of the Great Barrier Reef Marine Park. A report to the GBRMPA.*

Great Barrier Reef Marine Park Authority (GBRMPA). 1994. *A 25 Year Strategic Plan for the Great Barrier Reef World Heritage Area: Keeping it great.*

Kelleher, G. 1986. Managing the Great Barrier Reef. *Oceanus.* 29, pp. 13-19.

Kelleher, G. and Kenchington, R.A. 1982. Australia's Great Barrier Reef Marine Park: making development compatible with conservation. *Ambio.* 11, pp. 262-267.

Internet:

Great Barrier Reef Marine Park Authority
<http://www.erin.gov.au/portfolio/gbrmpa/gbrmpa.html>

Reviewed by:

Jon Day, Regional Manager, Queensland, Australia.
Chris Bleakley, Great Barrier Reef Marine Park Authority (earlier draft).

KERMADEC ISLANDS MARINE RESERVE, NZ

ISSUES	DESCRIPTION
Objectives	The primary objective of establishing the marine reserve around the Kermadec Islands was to declare a unique and significant area for conservation and scientific study. The provisions of the *Marine Reserves Act* seeks to maintain areas in a natural state and to ensure freedom of public access.
Area evaluation method	The Kermadec area was deemed suitable for a marine reserve based on its uniqueness, high importance to scientific research and suitability to the representative network of marine reserves already forming in New Zealand.
Site selection criteria	The Kermadec Islands area was selected as a marine reserve because of its uniqueness and scientific importance. In addition to being a unique area, the Kermadec Islands were identified as one of New Zealand's biogeographic zones. A workshop in 1992 created a biogeographic classification system for New Zealand to aid the Department of Conservation (DoC) in the establishment of a network of both unique and ecologically representative marine reserves.
Stakeholder consultations	Each marine reserve application is subject to a detailed public consultation process. The key interest groups which are regularly consulted include commercial fishers, recreational fishers and Maori. These groups were notified and presented with a draft reserve plan. The stakeholder groups were then given a two month period to submit objections and comments. This process is mandated under the *Marine Reserves Act*.
Area establishment	Under the *Marine Reserves Act* 1971, any organization with a proven interest in the marine environment may apply for the establishment of a marine reserve, including NGOs, government departments, public groups especially formed for the purpose, and local authorities. The applicant is responsible for public advertising, consultation, and answering objections. The Director-General of Conservation forwards the application, objections and answers to the Minister of Conservation, without making a recommendation. The Minister considers the application, and reviews the objections, and makes a decision. If the Minister agrees, s/he seeks the concurrence of the Ministers of Fisheries and Transport, and the consent of the Local Authority. The Minister the recommends to the Governor-General of NZ that an Order in Council be promulgated, which formally establishes a reserve. The Kermadec Islands reserve was actually proposed by a government department, the former Department of Lands and Survey, and following the establishment of the DoC in 1987, the proposal was transferred to that agency as an applicant. This was the first marine reserve initiated by a government department in New Zealand. It is nearly 1000 times larger then the average marine reserve in New Zealand -- it extends 12 nm. around each of the Kermadec islands, totals 748,000 ha, and is by far the furthest reserve offshore (900 km). The reserve extends from the mean low water line to the Kermadec Trench, and includes three separate areas.

ISSUES	DESCRIPTION
Lead agency	In 1987 the Department of Conservation (DoC) was established as the principle protected area agency in New Zealand. It is responsible for reviewing proposals, selecting areas, and managing reserves. The Ministry of Fisheries performs surveys in the areas, but the Reserve is administered by the DoC.
Multi-sector partnerships	The management committee is made up of representatives from the DoC, plus members of the local community, applicant group, local authority, university, and sometimes a representative of another government department, such as Fisheries.
Management measures	Under the *Marine Reserves Act*, a management committee was formed. They put up public notices and appoint local rangers. The public is allowed into the Kermadec reserve for education and observation. Fishing and aquaculture are prohibited. (See also section on Legal Mechanisms).
Community Involvement	Each marine reserve application is subject to a detailed public consultation process. The key interest groups which are regularly consulted include commercial fishers, recreational fishers and Maori.
Research requirements and activities	Scientific expeditions to the Kermadecs are a high priority, as much of the area has not yet been studied. The remoteness of site makes research difficult and costly. There is no coordinated program of study.
Legal mechanisms	The *Marine Reserves Act* of 1971 is the primary legal mechanism for establishing marine reserves in NZ. Originally the Act specified that a marine reserve was to be a strict 'no-take' zone. Amended in 1978 to allow for management committees to permit some specified fishing, but only at the Order-in-Council stage. No fishing is permitted at Kermadec, and fishing at any NZ reserve will terminate in October of 1998. Overnight visitors are not permitted to camp, but must stay in one of two buildings used by the workers. Overnight stays are regulated under the *Reserves Act* of 1977, as the terrestrial environment is a Nature Reserve. There are no discharge regulations for ballast or grey water.
Monitoring	The Kermadec islands has a meteorological station staffed by meteorological staff and the DoC: there are five employees. The success of the site is largely due to physical remoteness: only one large cruise vessel has ever visited, and the usual traffic is no more than ten small vessels per year.
Enforcement	Staff at the Meteorological station visually monitor the area, and would radio any activity from fishing vessels in the area to the mainland. The sight horizon extends not much beyond 7 miles. The NZ Air Force carries out regular fisheries compliance patrols within the EEZ of New Zealand, and would respond to a call from the Kermadecs.

ISSUES	DESCRIPTION
Public education/ constituency-building	One function of the marine reserve is to provide opportunity for public education and observation of this unique marine habitat. Underwater wilderness recreation is a focus for education, but there is no formal education program of any kind.
Socio-economic benefits	Tourism in the form of boating, diving and recreational fishing occurs in the Kermadec Marine Reserve. Although it was never a commercial fishing area, two commercial species live in the area and are studied by scientists with the hope of gaining knowledge which will aid in the management of the fisheries for these species in other areas of New Zealand.
Funding	Government funded.

Summary

The Kermadec Islands Marine Reserve, the largest and most remote marine protected area in New Zealand, was gazetted in 1990, five years after the initial application for the reserve was completed. The site was approved on the basis of the areas uniqueness and scientific interest. Since then, the Kermadec Islands region has been designated as one of New Zealand's biogeographic zones and now fulfills the criteria of representativeness as well. The flora and fauna of the Kermadec Islands are distinctively different from either mainland New Zealand or Australia, undoubtedly related to its great distance (900 km) from the mainland. As is expected in such isolated areas, a large portion of the species found there are endemic; including 29% of the lace corals, 30% of the polychaetes, 34% of the mollusks, and 44% of the sea stars and brittle stars. The marine flora and fauna have been little exploited to date, but they are of unique value and considered highly vulnerable.

Applicability to Canadian Offshore MPAs

Although the Kermadec Islands are much farther offshore than any Canadian MPA would be, the issues and difficulties which accompany the establishment and management of offshore protected areas would be similar. An examination and evaluation of management and enforcement in the Kermadecs would provide useful information on overcoming the problems of isolation, which are bound to occur in Canadian offshore MPAs as well. In general New Zealand's biogeographical classification system is a good mechanism to facilitate the establishment of a network of representational reserves. It is important to note that the lack of historic commercial exploitation in the Kermadecs allowed for the establishment of such a large protected area. An area of importance to commercial fishing would be much more difficult to negotiate.

Literature Cited

Ballantine, W.J. 1991a. *Marine reserves for New Zealand.* University of Auckland Leigh Laboratory Bulletin No. 25. Warkworth, New Zealand. 200 pp.

Creese, R.G. and Cole, R.G. 1995. Marine conservation in New Zealand. *Pacific Conservation Biology* 2(1), pp 55-63

Department of Conservation. 1990. *Kermadec Islands Marine Reserve Application For Order-In-Council.* Wellington, N.Z.

Kelleher, G., Bleakley, C., and Wells, S. 1995. *A Global Representative System of Marine Protected Areas.* 4 volumes. Great Barrier Reef Marine Park Authority, The World Bank, and The World Conservation Union. Washington D.C.

McNeely, J.A., Harrison, J. and Dingwall P. (eds.) 1994. *Protecting Nature: Regional reviews of protected areas.* IUCN, Gland, Switzerland, 402 pp.

Walls, K. and Dingwall, P. 1995. Marine region 18, Part B: New Zealand. pp. 172-199. In Kelleher, G., Bleakley, C., and Wells, S. (eds.) *A Global Representative System of Marine Protected Areas.* Vol. IV. Great Barrier Reef Marine Park Authority, The World Bank, and The World Conservation Union. Washington D.C.

Internet

New Zealand Department of Marine Conservation Marine Reserves
<http://www.doc.gov.nz/biodiver.ahe0996.htm>

Reviewed By:

Alan Baker, Department of Conservation, New Zealand
Craig F. Millar, University of Auckland, New Zealand

STELLWAGEN BANK NATIONAL MARINE SANCTUARY, U.S.

ISSUE	DESCRIPTION
Objectives	The primary objectives of the Stellwagen Bank National Marine Sanctuary centre around resource protection, research, interpretation, education and visitor use. The highest priority management is protection of the marine environment and resources through THE establishment of cooperative agreements among participatory agencies, co-ordinated enforcement of all applicable federal and Sanctuary regulations; promotion of public awareness and voluntary user compliance, and the development of contingency emergency response planning.
Site selection	This offshore bank is one of the richest, most productive marine environments in the U.S. It is a tremendous upwelling area, which makes it one of the most important areas in the North Atlantic for whales, a nationally recognized fishing ground, and area of high species diversity. Site identification procedures are detailed in the Program Development Plan (PDP) for the National Marine Sanctuary Program (Jan. 1982). These were used to develop a site Evaluation List made up of sites identified to NOAA by regional resource evaluation teams.
Legal mechanisms	The U.S. Secretary of Commerce is authorized under Title III of the *Marine Protection, Research & Sanctuaries Act* 1972, to designate discrete marine areas of special national significance as National Marine Sanctuaries. The Marine Sanctuaries Division (MSD), part of the National Oceanic and Atmospheric Administration's National Ocean Service, is responsible for the overall management of the Marine Sanctuary. It co-ordinates its activities through cooperative agreements with the commonwealth, regional, local and other Federal agencies. The Sanctuary Manager reports directly to the Division Chief of MSD. The National Marine Fisheries Service (within NOAA) has responsibility for implementation of Fishery Management Plans and implementation of the *Marine Mammal Protection Act* and *Endangered Species Act*. The U.S. Fish and Wildlife Service administer the *Migratory Bird Treaty Act* particularly regarding seabird entanglements in fishing gear. U.S. Coast Guard is responsible for enforcement of Federal Laws in U.S. waters including vessel traffic, search and rescue.

ISSUE	DESCRIPTION
Monitoring	Monitoring studies in general focus on changes in ecology, environmental quality and human activity. Continual monitoring programmes were initiated to provide an understanding of the long-term processes and changes occurring in the system. Monitoring of research performance is undertaken by the Sanctuary Manager who maintains records of research, equipment, frequency of researchers visits, and current progress on each project through Sanctuary Research Permits. This also helps in production of interim and final progress reports by researchers to Sanctuary Manager and MSD. U.S. Coast Guard monitors the Sanctuary via overflight surveys and vessel patrols. Also year-long systematic shipboard Sanctuary use survey by the International Wildlife Coalition conducted in 1995 is used as a monitoring baseline for current use surveys conducted in cooperation with the National Undersea Research Center at the University of Connecticut provides information on fish production and trends in species abundance and composition. Currently developing site specific, comprehensive monitoring programme to complement, not duplicate, existing regional monitoring programme.
Community involvement	Collaboration with public and private organizations focus on promotion of compatible uses of the sanctuary, and information exchange concerning its commercial and recreational use. 'Outreach Programmes' are coordinated jointly with local and regional study organizations (e.g., Center for Coastal Studies, Cetacean Research Unit, International Wildlife Coalition). There are provisions for public involvement in feedback regarding the effectiveness of interpretation/education. An Advisory Council for the site includes users and other stakeholders.
Research requirement and activities	Research is undertaken on both site and resource specific bases. 25 (and rapidly increasing) research and education institutions/agencies conduct activities in the SB area. These largely focus on living resources, involving both on-site and off-site programmes. Research is also targeted at overall physical processes of the whole Gulf of Maine area. Topics include variation in food availability and contribution of this to changes in distribution of cetacean feeding patterns. The Sanctuary Research Plan is developed by the Sanctuary Manager and Sanctuary Research Coordinator, who also prepare an assessment of research needs/priorities based on management requirements and research continuity (natural, cultural and socio-economic). The overall research plan is coordinated with efforts of existing institutions and provides for individual projects. The plan is modified and updated as necessary. Stellwagen Bank and Dominican Republic's Silver Bank sanctuaries are cooperating to increase knowledge and protection for humpback whales and are producing an Internet-based whale migration study.

ISSUE	DESCRIPTION
Lead agency	The National Oceanic and Atmospheric Administration (NOAA) administers the National Marine Sanctuary Program through the National Ocean Services (NOS) Marine Sanctuaries Division (MSD), in the Office of Ocean and Coastal Resource Management (OCRM).
Multi-sectoral partnerships	NOAA works closely within the existing administrative framework of ocean and coastal management agencies to ensure a co-ordinated approach to the ocean resource management. Their aim is to cooperate fully with other Federal and relevant regional and state programmes (eg. Massachusetts Bays Programme, Gulf of Maine Council on the Marine Environment, MA and NH State CZM Programmes), and can involve formalization of cooperative agreements & Memoranda of Understanding. An MOU on Enforcement with the U.S. Coast Guard and NOAA Office of Enforcement has resulted in considerable enforcement activities in the site. NOAA also works with owners/holders/applicants for leases, licences, permits approvals etc. as well as appropriate issuing agencies.
Management measures	The management plan is designed to guide management of the Sanctuary for the first 5 years following designation. Management measures occur in 3 basic programmes: resource protection (natural and cultural), research and interpretation. Management measures include a set of Sanctuary regulations: (a) discharges and deposits of materials within the Sanctuary are prohibited; (b) dredging, excavation or any alteration of, or construction on the seabed within the Sanctuary is prohibited; (c) all phases of development linked with extraction of industrial materials are prohibited; (d) submerged pipelines and cable installation are prohibited. Other restrictions relating to litter, lightering activities, removal of marine mammals, reptiles and seabirds also apply. Shipwrecks are protected and maritime history and culture is a major public interest. All regulations apply in or throughout the sanctuary - *ie*. there is currently no zoning/differing levels of protection.
Co-management	Areas within and surrounding the sanctuary are subject to a number of management plans. Some of these don't deal with the sanctuary directly but will affect/be affected by its designation. For example, Regional Management (within Massachusetts and New Hampshire) may affect relative difficulty in gaining access to the Sanctuary from adjacent harbours. Two State programmes (eg. the Massachusetts CZM and the New Hampshire Coastal Program) and Joint State/Federal Programmes (U.S. EPA for the area under the National Energy Programme) will also have some limited effect. Fisheries are managed jointly by the New England Fishery Management Council and the Mid-Atlantic Fishery Management Council, in cooperation with the National Marine Fisheries Service, through a number of species-specific management plans.

ISSUE	DESCRIPTION
Enforcement	Surveillance and enforcement are seen as essential to the resource protection programme. U.S. Coast Guard has broad responsibility for enforcement of Federal laws in navigable waters under US jurisdiction. In the Sanctuary area, fishing harvests are enforced by U.S. Coast Guard, and National Marine Fisheries Service. Analysis of human activities in the Sanctuary is supported by U.S. Coast Guard and there is an annual assessment of enforcement effectiveness. In addition to legal requirements, there is promotion of voluntary user compliance with regulations.
Public education/ Constituency building	Public awareness, understanding and appreciation of the SB ecosystem is considered essential for its protection and continued vitality. Interpretive information is targeted at a variety of audiences, particularly user public. Sanctuary staff make interpretive materials available to local/regional schools & universities, as well as in areas of high public visitation (*e.g.* highway welcome centres and public docks) and especially through the whale watch industry. Specific education objectives are: (1) provision of public with information on sanctuary goals, objectives, wise use of resources and long-term viability; (2) Enhance/broaden support through provision of programmes for wide variety of visitor interests; (3) provide for public involvement by encouraging feedback on effectiveness of interpretation/education programmes; (4) Collaborate with other organizations in provision of education/interpretation services including extension and outreach programmes and volunteer projects.
Review and evaluation	The Marine Sanctuaries Division identifies, analyses and resolves major Sanctuary management problems in collaboration with co-managers, stakeholders, and the public. It ensures that the Sanctuary is run in a manner consistent with national programme policies and the Sanctuary management plan. MSD evaluates effectiveness of Sanctuary management and regulatory measures. The Sanctuary Manager is responsible for disseminating information about the National Marine Sanctuary Programme and the Sanctuary. He/she also reviews the Management plan periodically and recommends changes to MSD as needed. MSD reviews all interim and final research reports submitted by the Sanctuary Manager; reviews and approves list of annual priorities for education and the annual education budget prepared by the Sanctuary Manager. In addition, the division reviews and approves design proposals for educational facilities, and all educational/interpretive materials prepared for Sanctuary.
Feedback mechanisms/ Remedial efforts	The Sanctuary reviews and updates its management plan once every five years. The Sanctuary also can address unanticipated issues requiring regulatory action through emergency regulations, or using the standard Federal rulemaking process.

ISSUE	DESCRIPTION
Stakeholders consultation	The Sanctuary Advisory Council represents stakeholder interests and meets with the Sanctuary Manager bi-monthly. Groups, individuals and agencies are consulted to ensure all interests are taken into account and that the SAC is representative of a broad based constituency. Interests include fishing, whale watching, boating, research, environmental education, regional and coastal /ocean management initiatives. Public consultations and workshops related to implementation of or modifications to the Sanctuary Management Plan or regulations enable stakeholder consultation from any early stage. The Sanctuary Research Plan was developed and is updated in collaboration with the regional scientific community.
Socio-economic benefits	An extensive and active commercial fishery with more than 280 vessels operated in SB in 1990 with landings value of over $15 million. Numerous vessels conduct whale watching and sportfishing trips in the area, providing a direct input of over $22 million into the coastal economy. Sportfishing is another multi-million dollar operation in the region. Whale watch vessels must comply with operating guidelines, but no other regulatory controls currently exist for vessel operation in the Sanctuary. SB is within the northwest part of N. Atlantic Planning Area of the Atlantic Oceanic Continental Shelf Region, but considerable seismic survey activity has failed to identify the presence of oil or natural gas in the Sanctuary. Sand and gravel mining potential has been identified by the Minerals Management Service, and concerns over possible environmental effects have led to an absolute prohibition on exploration and development of sand and gravel in the Sanctuary. Historical and cultural resources such as prehistorical materials and shipwreck sites in the area also attract the interest of visitors
Funding	Annual funding of approximately U.S. $500,000 is provided by federal government. MSD develops a general budget for the National Marine Sanctuary Programme, laying out programme development expenditure, operating costs and staffing. Funding priorities are reviewed and adjusted annually to reflect evolving programme priorities and requirements. As a result of designation, increased monies for research and education have come to the Sanctuary through partnerships with other co-management agencies. The Advisory Council provides advice on opportunities for funding options for Sanctuary management.

Summary

Stellwagen Bank, off New England's coast, was designated a National Marine Sanctuary in 1993. The intense upwelling of nutrient rich waters in this shallow offshore area provide critical habitat to migrating whales and host of local flora and fauna. Both environmental and commercial fishing interest groups lobbied for the protection of the area for over 12 years.

Applicability to Offshore MPAs

Stellwagen Bank NMS illustrates that it is possible and valuable to designate areas of open water, remote from land, as MPAs. The major interest at the site, cetaceans, are migratory, and are therefore not at the site at all times of the year, but the Sanctuary is in place to ensure that the critical habitat that supports these pelagic visitors is maintained and protected. One reason the cetaceans return is because they continue to find favourable conditions at the site for feeding, and for nursing and nurturing their young. Management has used codes of conduct to promote responsible behaviour by Sanctuary users and, in common with other MPAs, put a heavy emphasis on education and awareness about the Sanctuary, its importance and the objectives of conservation in the area.

Literature Sources

Eldredge, M. 1993. Stellwagen Bank. New England's First Sanctuary. *Oceanus.* Fall 1993.

National Marine Sanctuary Program: Program Development Plan. 1982. Sanctuary Programs Office. NOAA, Washington.

NOAA. 1993. *Stellwagen Bank National Marine Sanctuary. Final Environmental Impact Statement/Management Plan.* 2 vols.

Internet

Homepage
<http://www.nos.noaa.gov/ocrm/nmsp/nmsstellwagenbank.html>

Sanctuaries and Reserves Division of the National Ocean Service
<http://www.nos.noaa.gov/ocrm/srd/>

Reviewed By:

Brad Barr, NOAA/Stellwagen Bank National Marine Sanctuary

FLORIDA KEYS NATIONAL MARINE SANCTUARY

ISSUE	DESCRIPTION
Objectives	The primary objectives of the Florida Keys National Marine Sanctuary (FKNMS) are to provide 1) comprehensive management of and protection to the marine ecosystem surrounding the Florida Keys, 2) sound management strategies, active enforcement of regulations, long-term research and creative education methods to ensure the preservation and sustainable use of this national treasure, and 3) protection of cultural and historical artifacts contained within its boundary.
Site selection	This marine ecosystem supports one of the most diverse assemblages of plants and animals in the only coral reef in the continental U.S. It also contains cultural resources with a high concentration of shipwrecks and historic lighthouses. In addition, Key Largo & Looe Key NMS within FKNMS, and various state sites, provide protection of representative sections of the reef.
Legal mechanisms	The U.S. Secretary of Commerce is aathorized under Title III of the *Marine Protection, Research & Sanctuaries Act* 1972, to designate discrete marine areas of special national significance as National Marine Sanctuaries. FKNMS however, was designated directly by the U.S. Congress. The Sanctuaries & Reserves Division (SRD) is responsible for the overall management of the FKNMS. It co-ordinates its activities through cooperative agreements with the state, regional, local and other Federal agencies. The State retains all jurisdiction over management and enforcement matters within Florida waters. Federal authorities have no jurisdiction above the mean high water mark. Recent changes give the State Governor, not Sanctuary superintendent, emergency powers to shut down the Sanctuary for 90 days. The Florida Marine Fisheries Commission has control over implementation of fishing regulations in Florida waters. The State, not NOAA, will control any area zoning regulations in Florida waters. NOAA only has review and comment role on permits in areas of Florida jurisdiction.
Monitoring	Sanctuary officers keep daily visitor census forms detailing all types of use including: monitoring of weather data, sea conditions, water visibility, recreational and commercial activities, research activity, educational groups and a record of the officers daily activity (eg. Interpretative contacts, violations observed, enforcement actions). This allows for maximum water patrol enforcement surveillance during peak periods.
Community involvement	Public consultation was an important component in the process leading to the development of the Final Plan which was coordinated by the Sanctuary Advisory Council and NOAA. The plan has recently been approved by the State.

ISSUE	DESCRIPTION
Research requirement and activities	Four 'Special Use Areas' have been designated for research only in the recently approved Final Plan. Long-term research is an important priority
Lead agency	The National Oceanic and Atmospheric Administration (NOAA) administers the National Marine Sanctuary Program through the Sanctuaries and Reserves Division (SRD), in the Office of Ocean and Coastal Resource Management (OCRM). Florida Department of Environmental Protection (FDEP) also has concurrent control over the Sanctuary. The State has the right to suggest changes to the plan at any time and the FDEP will monitor public opinion.
Multi-sectoral partnerships	State and Federal Governments work together. 65% of the area is in State waters.
Management measures	Water quality and zoning action plans include no-take zones that represent some of the best remaining marine habitats in the Florida Keys. However, there is still a need for links with land use management and in particular runoff from agricultural land. Sewage treatment also needs to be improved and is currently being examined through a major scheme. The State has the right to suggest changes to the management plan at any time. The Final Plan reapproves State and local control of, and jurisdiction over management and enforcement matters.
Co-management	FDEP and NOAA consult and manage the Sanctuary together. During consultation over the plans, there was strong support from other groups including, the Center for Marine Conservation, other national and local conservation organizations, scientists, divers and many Keys residents.
Enforcement	In 1982 the National Marine Sanctuary Program decided to strengthen cooperation with the State of Florida and the U.S. Coast Guard. This provided funding from the Federal Sanctuary programme for all law enforcement activities. There is a high degree of federal state coordination, and activites are described by the Enforcement Action Plan. The Cooperative Enforcement Agreement between the federal and state governments defines the cooperation and coordination between agencies. High use and sensitive areas are identified and additional enforcement efforts are concentrated there. Officers are able to enforce both sanctuary regulations as well as federal natural resource laws within the FKNMS. Infractions of Sanctuary regulations are civil violations and prosecuted as civil actions. Penalties for violations of regulations are generally fines. The *Marine Protection, Research and Sanctuaries Act* (1972) specifies penalties up to $10,000 per day per violation.

ISSUE	DESCRIPTION
Public education/ Constituency building	Significant emphasis is attached to public education. Sanctuary Enforcement Officers provide visitors with interpretive material/literature. Because much of the sanctuary can be approached by boat from a number of directions, getting information to visitors prior to their trip is difficult. The following approaches are used: slide presentations, interpretive displays, brochures, posters and other literature, outdoor signs and maps with regulations at boat slips and diver shops. In addition, frequent users (e.g. Boat skippers, education groups, show owners) are invited to annual meetings where management topics are discussed.
Review and evaluation	FDEP and NOAA will submit a five year review of the Sanctuary
Feedback mechanisms/ Remedial efforts	Remedial efforts centre around creation of no-take zones. Small areas may not be large enough to hold a full range of suitable habitats necessary to support many reef species. Still they could protect fish/coral spawning activities and therefore potentially improve fisheries.
Stakeholders consultation	The Sanctuary Advisory Council represents a range of interests including diving, fishing, treasure salving, and county commission. Considerable effort is put into making public comment from local stakeholders an integral part of any decision.
Socio-economic benefits	Commercial fishing, and tourism (especially diving and fishing) greater benefit the area. 1.5 million people/yr dive on the Keys, providing business for dive boat operators.
Funding	Funding is federal. The SRD develops a general budget for the National Marine Sanctuary Programme, laying out programme development expenditure, operating costs and staffing. Funding priorities are reviewed and adjusted annually to reflect evolving programme priorities and requirements. As a result of designation, increased monies for research and education are available.

Summary

The Florida Keys National Marine Sanctuary is a newly established MPA which consists of approximately 9,500 sq. km of coastal and offshore waters. Since 1989, several environmental organizations and individuals have worked to estabish this area as a marine sanctuary. In 1990 the *Florida Keys National Marine Sanctuary and Protection Act* established the MPA. NOAA subsequently developed a comprehensive management plan for the new sanctuary in 1996 and this plan was just recently approved. Because tourism is a primary source of revenue in the area, a healthy natural environment is highly important to the local economy.

Applicability to Offshore MPAs

The Florida Keys National Marine Sanctuary has gone through considerable development since it was first established. One of the most significant changes has been the incorporation of several smaller sanctuaries (Looe Key & Key Largo) into a larger sanctuary. This has come about through a recognition that effective management of the reefs requires consideration of the larger picture - how the ecosystem as a whole functions and the influences on it from land and at sea. Although such considerations were always apparent, the expansion of the area of the sanctuary means that these issues can now be actively considered within the park structure to enable more active management.

The need for cooperation between the different agencies operating in the area is also well illustrated in the Keys with Sanctuary Offices having authority through the US Coast Guard as well as the State of Florida. The popularity of the area with nearby residents and visitors means that presence on the water of officers is important to illustrate that there is active management of the area. The frequent use has also meant there have been incidents. In the case of the FKNMS a scale of fines has been agreed. From major groundings to smaller scale incidents it is clear to users that there are consequences of damage to the park. At the same time it has been possible to put a lot of emphasis on compliance rather than regulation.

The gradual deterioration of some of the reefs in the Keys has been a cause of concern for some years. Much research has been focused on this issue and restoration programmes have been instituted. They show that even offshore, it is possible to actively enhance the prospects of the recovery of degraded marine habitats.

Literature Sources

Barley, G. 1993. Integrated coastal management: the Florida Keys example from an activist citizen's point of view. *Oceanus* 36(3), pp. 15-18.

Bohnsack, J.E. (in press). Consensus development and the use of marine reserves in the Florida Keys National Marine Sanctuary. *Proceedings of the 8th International Coral Reef Symposium, Panama.*

NOAA. 1996. *Florida Keys National Marine Sanctuary Final Management Plan/ Environmental Impact Statement*, 3 volumes.

Sobel, J. 1996. NOAA releases "Final" Plan for Florida Keys Sanctuary. *Marine Conservation News*. Center for Marine Conservation, USA.

Suman, D. O. 1997. The Florida Keys National Marine Sancturary: A Case Study of an Innovative Federal-State Partnership in Marine Resource Management. *Coastal Management*. 25(3): pp. 293-324.

Internet:

<http://www.florida-keys.fl.us/ntmarine.htm>

Reviewed By:

Daniel Suman, University of Miami, Florida.

WADDEN SEA (North Sea)

ISSUE	DESCRIPTION
Objectives	Achievement as far as possible of a natural and sustainable ecosystem that includes all six habitat types in which natural processes proceed in an undisturbed way. Each habitat type must attain a certain quality (natural dynamics, absence of disturbance, absence of pollution) through proper conservation and management. General objectives: improve water and sediment quality, and the support of bird and marine mammal populations. Objectives specific to habitat type include: increase the area of salt marsh, undisturbed tidal flats and subtidal areas; increase natural dynamics of beaches, primary dunes, beach plains and primary dune valleys; develop favourable conditions for migrating and breeding birds; increase area, natural distribution and development of mussel beds; and, develop viable stocks and reproductive capacity of common seal, grey seal and harbour porpoise.
Site selection	The Wadden Sea represents the largest unbroken stretch of intertidal mud flats in the world; with transition zones between land, marine and freshwater environments, it is extremely productive and rich in species, . An area of global importance, the Wadden Sea provides food for 10 to 12 million migrating birds each year. It is also a very important nursery ground for fish with an estimated 80% of the plaice, 50% of the sole and 40% of the herring caught in the North Sea using the shallow waters of the region as a nursery ground. The area is delimited on the landward side by the main dike, or where a dike is absent, by the spring high tide line. In rivers, the brackish water limit is the landward boundary. The offshore zone extends 3 nautical miles seaward from baselines. More inland areas are designated by the EC Bird Directive or by Ramsar. All the islands are included. The protection regime depends on the country, with the trilateral conservation areas having the highest protection level. In areas not covered by a conservation regime, human activities may have priority; this activity must not negatively affect the more protected areas.

Legal mechanisms	Jurisdiction is shared between Denmark (10%) Germany (60%) and the Netherlands (30%). Co-operative action between the three countries was formalized in 1982 with a Joint Declaration on the Protection of the Wadden Sea, outlinin an agreement to consult and co-ordinate activities on the implementation of a number of key international environmental protection agreements: Ramsar Convention, Bonn Convention, Berne Convention and EC Bird and Habitat Directives. Trilateral governmental conferences are held every 3 to 4 years with Ministerial Declarations which re-emphasize the need for co-operation and collaboration, look at progress and identify future areas of work. Implementation is through national provisions and therefore via three separate legal and administrative systems. Most of the area is covered by the relevant conservation designation in the country: National parks and nature reserves in Germany, the Danish Nature and Wildlife reserve, and the Dutch Memorandum area (Key Physical Planning Decision [PKB] of 1980, amended 1993).

ISSUE	DESCRIPTION
Monitoring	A Trilateral Monitoring & Assessment Program (TMAP) of the Wadden Sea was established in 1994 to provide a scientific assessment of the status of the ecosystem and the implementation of Targets as adopted in the Wadden Sea Plan. Results are published in Quality Status Reports (QSR). The Trilateral Monitoring and Assessment Group (TMAG) implements the program and prepares the QSRs. The 'DemoWad' project (Demonstration of the Preparation and Implementation of an Extensive Integrated Monitoring Programme with the Wadden Sea as a Model), funded by the European Union, 1994-1998, provides internet access to monitoring guidelines and the data management system. At the 8th Trilateral Governmental Conference in 1997, the ministers agreed to common monitoring parameters to be implemented in the TMAP in the coming years. TMAG also focuses on selected aspects of ecological research and the introduction of new multipurpose monitoring techniques, *e.g.* remote sensing.
Community involvement	Public consultation on trilateral proposals at the national level.
Research requirement and activities	International Scientific Wadden Sea Symposia are held at regular intervals at the Trilateral Governmental Conferences. In 1996 the 9th such Symposium was attended by approximately 200 scientists and representatives from government and NGOs. The theme was ecosystem research, and a number of recommendations were made: reaction to unpredictable events like blackspots (establishment of a Task Force); eutrophication (reduction of nitrogen inputs, research project on effects of toxic substances on zooplankton); monitoring (implementation of the full TMAP, enhancement of remote sensing techniques and species banking, establishment of expert working groups for assessment); shellfish fisheries (restriction of mussel fisheries); integrated coastal zone management (need for an integrated trilateral management concept).
Lead agency	The Trilateral Governmental Conferences are held every 3 to 4 years with the participation of the ministers responsible for environmental and nature protection. Between such conferences, senior officials from those ministries and a permanent Trilateral Working Group (TWG) are charged with the preparation and elaboration of trilateral policy issues. Along with ministerial representation, the TWG includes regional authorities. The TWG can also establish *ad hoc* working groups to execute special tasks. The Trilateral Monitoring and Assessment Group (TMAG) is a permanent working group under the TWG. The Common Wadden Sea Secretariat (CWSS) was established in 1987 in Wilhelmshaven, Germany to support, initiate, facilitate and co-ordinate the activities of the collaboration.

ISSUE	DESCRIPTION
Multi-sectoral partnerships	The Netherlands, Germany and Denmark have cooperated on the protection of the Wadden sea since 1978, when the first Trilateral Governmental Conference was held. Since 1982 the three countries have attempted to link policies via the trilateral consultations. The result is a consultative structure and some co-operation. The 'Joint Declaration' forms the basis of the co-operation. The 1997 Wadden Sea Plan is a framework for the overall Wadden Sea management, to be implemented by the three countries based on their national legislation.
Management measures	The 1997 Wadden Sea Plan includes policies, measures, projects and actions agreed upon by the three countries. The Plan is a framework for the overall Wadden Sea management and will be revised at regular intervals. Its Guiding Principle is: "to achieve, as far as possible, a natural and sustainable ecosystem in which natural processes proceed in an undisturbed way". Eight management principles have been adopted: Principle of Careful Decision Making; Principle of Avoidance; Precautionary Principle; Principle of Translocation; Principle of Compensation; Principle of Restoration; Principle of Best Available Techniques; and Best Environmental Practices. In addition, common objectives have defined regulations that address all major and common uses and activities in the Wadden Sea, and set standards for their operation. The individual countries use zoning schemes. Germany has Zone I (strict regulation) and Zone II (activities permitted under certain conditions). In Denmark and the Netherlands, strict regulations regarding public admittance, recreational activities, fishery and shipping apply for selected areas.
Co-management	The Wadden Sea Plan adopts trilateral actions to enhance and improve public participation at the national level through the provision of the TMAP results and Internet information to the relevant authorities, interest groups and local citizens.
Enforcement	Since implementation occurs at the national level, so does enforcement. The Trilateral Government Conferences assess the progress of Target implementation. The need for greater control in protecting the zoning system including improved enforcement, has been suggest.
Public education/ Constituency building	The implementation of the Wadden Sea Plan requires stakeholder involvement and improved public information at the trilateral level (making TMAP monitoring results available, establishment of a trilateral information and communication Internet site), and at the national level (public education activities to promote awareness, *e.g.* through seminars, publications and leaflets).

ISSUE	DESCRIPTION
Review and evaluation	The Trilateral Governmental Conferences review and evaluate policies and management measures, based on an assessment report that identifies the main issues of concern regarding the Wadden Sea ecosystem. The Wadden Sea Plan, the framework for the trilateral management, will be revised at regular intervals. At the national level, Advisory Councils, representing inhabitant groups, local authorities and NGOs also provide valuable input to the trilateral level.
Feedback mechanisms/ Remedial efforts	The EC Directive on EIA requires research into impacts of a project be undertaken prior to its inception. EIA also provides feedback regarding consequences of a project. Since the emphasis is on ecosystem processes proceeding in an undisturbed way, there are few restoration projects. Examples that do exist include re-embankment of summer polders, maintenance of small, uninhabited islands important for breeding birds.
Stakeholders consultation	The Wadden Sea Plan will be implemented through the participation of all interest groups. Possibilities of active stakeholder involvement will be explored to enhance the quality of public participation. The Netherlands has developed a communication plan to stimulate interaction between stakeholders and policy/decision makers.
Socio-economic benefits	Economic structure of the Wadden Sea and immediate hinterland suffers from a lack of diversity in employment. Indirect benefits are expected from the protection of the area, *e.g.* protection of nursery grounds for important commercial species has spin-off for states fishing in the North Sea.
Funding	All activities of the Trilateral Cooperation, including the Common Wadden Sea Secretariat, are funded equally by the Netherlands, Germany and Denmark within national budgets. The DemoWad project is co-funded by the LIFE-NATURE program of the European Union.

Summary

The Wadden Sea is protected by a trilateral agreement between Denmark, Germany and the Netherlands based on the Joint Declaration of 1982. The area is of primary importance to migratory birds as important feeding grounds and to several fish populations as a nursery ground. The success of co-operative management of the area by the three nations is exemplary.

Applicability to Offshore MPAs

Although the Wadden Sea lies close to the shores of the Netherlands, Germany and Denmark, there are some interesting ideas relating to the management of activities in this region which are relevant to offshore MPAs.

The Trilateral Governmental Conferences are pivotal to the successful management of the area. By bringing together the three countries they recognize that the ecosystem needs to be viewed in its entirety and that management of activities needs to be as consistent as possible throughout the area. The setting of agreed objectives, regular reporting, and a formalized review process at a high level within Government ensures that there is continuous momentum rather than dwindling of interest after designation of the area.

The Wadden Sea Plan, a common management plan for the area, has been adopted. The management and administrative arrangements for the Wadden Sea have combined international agreements and national measures in a way that ensures that the three countries can work to common objectives without losing sovereignty.

Literature Sources

Common Wadden Sea Secretariat. 1994. *Report of the Seventh Trilateral Governmental Conference on the Protection of the Wadden Sea. Nov. 30th 1994.*

Common Wadden Sea Secretariat. 1995. *The Wadden Sea -- A Shared Nature Area.* Wadden Sea Secretariat.

Common Wadden Sea Secretariat. 1997. *Report of the Eighth Trilateral Governmental Conference on the Protection of the Wadden Sea.* Statde, Germany, Oct. 22nd, 1997. (in print).

Nijkamp, H. & Peet, G. 1994. *Marine protected areas in Europe. Report of a study within the framework of the BioMar project.* LIFE92-1/IRL/001.

WWF. 1991. *The Common Future of the Wadden Sea.* A report by the World Wide Fund for Nature.

Internet:

Common Wadden Sea Secretariat, Trilateral Wadden Sea Cooperation
<http://www.de/CWSS/>

Reviewed By:

Harald Marencic, Deputy Secretary, Common Wadden Sea Secretariat

THE APO ISLAND RESERVE, PHILIPPINES

ISSUES	DESCRIPTION
Objectives	The rationale for the development of the Philippine system of marine parks and reserves was the recognized need for sustainable development and the maintenance of life support systems. In addition, the concept that resource management and conservation must be rooted in local communities was the underlying premise in the establishment of the Apo Island Marine Reserve.
Site selection criteria	An area where the local community was willing to participate in the protection of their marine resources and environment was of prime importance.
Stakeholder consultations	The stakeholders (*i.e.*, the local residents) play an active role in the establishment and management of the MPA.
Area establishment	Apo Island Reserve protects about 8% of a 106 ha coral reef. The reserve contains no-take areas, traditional fishing areas where destructive gear is prohibited, and protected breeding areas.
Lead agency	Academic institutions, the private sector and the Department of Natural Resources are all involved in the marine reserve system in the Philippines. The Apo reserve was established by the town of Dauin, Negros Oriental with assistance from Silliman University.
Multi-sector partnerships	Silliman University works together with the municipality of Dauin, Negros and the Apo barrio village in establishing and managing the reserve.
Management measures	Apo Island reserve is managed from the field by the local people and the municipal government.
Co-management	Apo Island reserve is actively managed by the local community on the authority of a municipal ordinance. A marine management committee consists of local residents, the municipal government and Silliman University.
Community involvement	At Apo Island local management is accomplished by the participation and knowledge of community members.
Research requirements and activities	Research is conducted through Silliman University.

ISSUES	DESCRIPTION
Legal mechanisms	The Philippine laws which are directed at marine conservation are on the whole inadequate. For example they do not regulate the exploitation of shells, aquarium fish and other marine resources. Apo Island has had legal protection at the municipal level since 1985 and in 1994 at the national level as a Protected Seascape under the National Integrated Protected Areas System (NIPAS).
Monitoring	Environmental monitoring is conducted by Silliman university to document the status of the coral reefs including fish populations and habitat conditions. In addition, fishermen-volunteers from the island compile lists of fish catches.
Enforcement	Enforcement of rules and regulations for Philippine reserves has been very difficult and poorly accomplished when legislated nationally. Locally established marine reserves like Apo Island, using municipal ordinances, have been more successfully implemented.
Public education/ constituency-building	At Apo Island, community education has been a major priority. Efforts have increased local people's awareness of the value of the reef habitat to the fishery.
Socio-economic benefits	Fishers have benefited from improved fish yields due to a large increase in the diversity and abundance of fish within the sanctuary.
Funding	Funding was provided for the initiation of the program in 1985 by USAID through the Asia Foundation which established the Marine Conservation and Development Program of Silliman University. Since that time, funding has come directly from Silliman University, Earthwatch Expeditions International, and private donations.

Summary

The high level of local involvement in the day to day workings of the Apo Island marine reserve is exemplary. The proposal for a reserve was initiated locally, established by the local municipality and now is managed by local people. The close proximity of the reserve to the coastal communities of Dauin and Apo barrio village allow for such extensive local participation.

Applicability to Canadian Offshore MPAs

This kind of achievement may be difficult in a remote offshore marine protected area. Nonetheless, such a high level of community initiative and involvement in the establishment and management of an MPA is an ideal which should be aimed for in all marine reserves.

Literature Sources

Alcala, A.C. 1988. Effects of Marine Reserves on Coral Fish Abundances and Yields of Philippine Coral Reefs. *Ambio.* 17, pp. 194-199.

Casteneda, P.G. 1993. Management Planning for the Palawan Biosphere Reserve. *Nature and Resources.* 29, pp. 1-4.

Kenchington, R. and Bleakley, C. 1994. Identifying Priorities for Marine Protected Areas in the Insular Pacific. *Marine Pollution Bulletin.* Vol. 29. pp. 3-9.

White, A.T. 1986. Marine Reserves: How effective as management strategies for Philippine, Indonesian and Malaysian coral reef environments. *Ocean Management.* 10, pp. 137-159.

White, A.T. 1987. Community-based marine reserves: a Philippine first. *Proceedings of Coastal Zone May '87.* Seattle, Washington.

White, A.T. 1988. The effect of community managed marine reserves in the Philippines on their associated coral populations. *Asian Fisheries Science.* 2(1), pp. 27-41.

White, A. T. 1996. Philippines: Community Management of Coral Reef Resources. *Coastal Management Handbook.* J. R. Clark. CRC Press: Florida. pp. 561-567.

Internet

National Parks and Reserves in the Philippines
<http://www.aenet.org/treks/philpark.htm>

Reviewed By

Alan T. White, Coastal Resource Management Project, Philippines.

Notes

1 The concept of the 'tragedy of the commons' was developed by Hardin, 1968.

2 Where a coastal state does not have the capacity to harvest the entire allowable catch, it is required to allow states access to the surplus.

3 It has been criticized for its weak treatment of marine biodiversity protection (VanderZwaag, 1995).

4 Referred to here as the Straddling Stocks Agreement.

5 The MEPC of IMO centers its activity around the implementation of the Resolutions adopted by the 1973 International Conference on Marine Pollution. More specifically, the MEPC seeks to resolve problems related to the entry into force of the *International Convention for the Prevention of Pollution from Ships, 1973* (Gold, 1996).

6 Canada has not incorporated Annex V, but instead has continued a prohibition on ships depositing garbage into Canadian internal, territorial and fishing zone waters (VanderZwaag, 1995).

7 The guidelines describe the criteria for identifying PSSAs and the process for applying to IMO for approval of protective measures.

8 Canada has consistently ranked in the top five in terms of human development world wide.

9 For a background on fisheries and the precautionary principle, see FAO, 1996.

10 See Beckman, 1996; FRCC, 1996; Shackell and Willison, 1995; Wells and Ricketts, 1996. DFO and Parks Canada have compiled a list of oceans stakeholders in preparation for consultations pertaining to marine programs and initiatives.

11 The distinction between diversity and productivity is especially important in the Canadian Arctic where a region can have low biodiversity but, in housing 95% of the world's population of a species, can be high in productivity and thus equally important from the standpoint of protection.

12 The consideration of future resource values is a contentious issue where the establishment of protected areas is concerned. Some argue that the potential economic value of future resources should prevent ANY area from being set aside in perpetuity for protection. The reverse view, however, is that the economic value of a functioning protected area over time outweighs the time-limited value of the resources extracted. This discussion will have to be held for each proposed protected area, and the ultimate decision will depend heavily on the specific objectives set out for the protected area. For instance, if preserving biological diversity is the objective, it will be appropriate to give less weight to the future value of extractive resources.

13 The physical characteristics of a system, including: species, genetic and ecosystem diversity, biotic composition (trophic structure), and species size distribution.

14 The processes occurring within a system and includes: nutrient cycling, bioaccumulation and biomagnification rates, predation cycles, alteration of the physical habitat, survival rates, and reproduction rates.

15 17 I.L.M. 579 (1978).

16 For more information on the Denmark-Sweden bridge and EIA, see Ackefors and Grip, 1995; Jensen et al., 1995; Partidario, 1993; Pearce, 1995.

17 For more information on oil and gas and EIA, see Henriquez, 1994; Morgan, 1994.

18 For the purpose of this analysis, section 35 (a) has been split into two sections dealing with two discrete concepts:

a Those areas that are "functionally criteria". These include spawning and feeding areas, and nursery grounds;

b Those areas that are reservoirs for recruitment. That is, these areas supply larvae to other areas.

19 It will be important to select sites using information not merely on species abundance but on specific stock assessment; genetic differences are important for ecosystem viability and consideration should be given to protecting vulnerable stocks, not merely vulnerable species.

20 It will be important to distinguish between species which are endangered in Canada because they are relict species (that is, their absolute global numbers are low) and those species that are endangered in Canada because they are at the northern (or southern) edge of their range. It may be useful to establish protected areas for 'edge range' species to monitor for global trends like global warming, which may affect the distribution of these species.

REFERENCES

Ackefors, H and Grip, K. 1994. *Swedish Coastal Zone Management -- A System for Integration of Various Activities.* Council Meeting of the International Council for the Exploration of the Sea. St. John, Newfoundland, 22-30 Sept. 1994. Copenhagen, Denmark. ICES.

Agardy, T. (ed.) 1994. *The science of conservation in the coastal zone: new insights on how to design, implement and monitor marine protected areas.* IUCN marine conservation and development report, Gland, Switzerland.

Agardy, T. S. 1995. Critical area identification and zoning in coastal biosphere reserves: one way to make marine conservation work in Canada. pp. 214-219. In Shackell and Willison (eds) *Marine Protected Areas and Sustainable Fisheries.* SAMPAA. Wolfville, N.S.

Agardy, T. S. 1997. *Marine Protected Areas andOcean Conservation.* Georgetown, Texas: R. G. Landes Company and Academic Press, Inc.

Allison, G. W., Lubchenco, J., and Carr, M. H. 1998. Marine Reserves are Necessary but not Sufficient for Marine Conservation. *Ecological Applications.* 8(1, Supplement), pp. 79-92.

Batley, B. 1997. OCS Coordinator, Ocean Research Program, Oregon. Personal Communication.

Ballantine, W.J. 1991. *Marine reserves for New Zealand.* University of Auckland Leigh Laboratory Bulletin No. 25. Warkworth, New Zealand. 200 pp.

Ballantine, W.J. 1995. Networks of 'no-take' marine reserves are practical and necessary. pp. 13-20. In Shackell and Willison (eds) *Marine Protected Areas and Sustainable Fisheries.* Science and Management of Protected Areas Association (SAMPAA), Wolfville, NS.

Ballantine, W.J. 1996. 'No take' marine reserve networks support fisheries. Presented to *2nd World Fisheries Congress, Brisbane.*

Ballantine, W.J. 1997. Design principles for systems of 'no-take' marine reserves. Presented to *Workshop on the Design and Monitoring of Marine Reserves, UBC, Vancouver, February 18-20, 1997.*

Beckman, L. 1996. *Seas the Day: Toward a National Marine Conservation Strategy for Canada.* National Marine Conservation Strategy Programme (Canadian Arctic Resources Committee and Canadian Nature Federation).

Biodiversity Working Group. 1994. *Canadian Biodiversity Strategy: Canadian Response to the Convention on Biological Diversity.* (November 1994). Ottawa.

Bohnsack, J.A. 1993. Marine reserves: They enhance fisheries, reduce conflicts, and protect resources. *Oceanus.* 36(3), pp. 63-71.

Borgese, E. M. 1996. *Ocean Governance and the United Nations.* 2nd ed. Halifax: Centre for Foreign Policy Studies, Dalhousie University.

Burke, D. L., O'Boyle, R. N., Partington, P., Sinclair, M. 1996. *Report of the Second Workshop on Scotia Fundy Groundfish Management.* Can. Tech. Rep. Fish. Aquat. Sci. 2100: vii + 247 pp

Canada. 1985a. *National Parks Act.* R.S.C. 1985, c. N-14.

Canada. 1985b. *Canadian Wildlife Act.* R.S.C. 1985, c. W-9.

Canada. 1996. *Oceans Act.* S.C. 1996, c.31.

Carr, M.H. and Reed, D.C. 1992. Conceptual issues relevant to marine harvest refuges: examples from temperate reef fisheries. *Canadian Journal of Fisheries and Aquatic Science* 50, pp. 2019-2028

Castilla, J. C. and Fernandez, M. 1998. Small Scale Benthic Fisheries in Chile: A Lesson on Co-management and Sustainable Use of Benthic Invertebrates. *Ecological Applications* 8:S124-S132

Conference of the Parties to the Convention on Biological Diversity. 1995. *Jakarta Mandate on Marine and Coastal Biodiversity.* UNEP/CBD/COP/2/19; UNEP/CBD/COP/2/5.

Couper, A. D. 1992. History of Ocean Management. *Ocean Management in Global Change.* P. S. Ganesh ed. London: Elsevier Applied Science. pp. 1-18

Davis, G. E. 1989. Designated harvest refugia: the next stage of marine fishery management in California. pp. 53-58 *California Cooperative Oceanic Fisheries Investigations Reports* 30. Symposium of the CALCOFI conference, Lake Arrowhead, California, U.S.A

Dayton, P. K., Thrush, S. F., Agardy, M. T. Hoffman, R. J. 1995. *Environmental Effects of Marine Fishing.* Aquatic conservation: Marine and Freshwater Ecosystems. 5(3), pp. 205-232.

Department of Fisheries and Oceans. 1997. *An Approach to the Establishment and Management of Marine Protected Areas Under the Oceans Act: A Discussion Paper.* Ottawa: Fisheries and Oceans Canada

Department of Fisheries and Oceans. 1998. *Toward Canada's Oceans Strategy: Discussion Paper.* Advance Copy. Ottawa.

Dugan J.E. and Davis, G.E. 1993. Applications of marine refugia to coastal fisheries management. *Canadian Journal of Fisheries and Aquatic Sciences.* 50(9), pp. 2029-2042.

Duran, L. R., Castilla, J. C., and Oliva, D. 1987. Intensity of Human Predation on Rocky Shores at Las Cruces in Central Chile. *Environmental Conservation.* 14: pp. 143-149

Dyer, M.I. and Holland, M.M. 1991. The biosphere-reserve concept: needs for a network design. *Bioscience* 41(5), pp. 319-325.

Economic Commission of Europe. 1990. *Economic Commission of Europe, Bergen Conference: Ministerial Declaration on Sustainable Development.* Action for a Common Future. Bergen, Norway, Sept [illegible]. Reprinted in *Environmental Policy and the Law.* 20(3), pp 10-103.

Farrow, S. 1996. Marine protected areas: emerging economics. *Marine Policy* 20 (6), pp. 439-446

Fisheries and Agriculture Organization (FAO). 1996. Precautionary Approach to Fisheries. Part 2: Scientific Papers. Prepared for the Technical Consultation on the Precautionary Approach to Capture Fisheries. Lysekil, Sweden, June 6-13, 1995. Fisheries Technical Paper 350, part 2. Roe: FAO.

Fisheries Resource Conservation Council (FRCC). 1996. *Building the Bridge: 1997 Conservation Requirements for Atlantic Groundfish.* FRCC 96.R.2, October, 1996.

Fisheries Resource Conservation Council (FRCC). 1997. *A Report on Gear Technology in Eastern Canada: Report of the Gear Technology Subcommittee.* FRCC.97.R.1, March, 1997.

Food and Agricultural Organization (FAO). 1993. *Report of the Technical Consultation on High Seas Fishing and the Papers Presented at the Technical Consultation on High Seas Fishing* Rome. 7-15 September, 1992. A/CONF.164/INF/2.

Food and Agricultural Organization (FAO). 1994. *Some High Seas Fisheries Aspects Relating to Straddling Fish Stocks and Highly Migratory Fish Stocks.* Fisheries Circular No. 879. Rome: FAO.

Food and Agricultural Organization (FAO). 1995. *A Code of Conduct for Responsible Fisheries.* Rome: FAO.

Food and Agriculture Organization (FAO). 1996. *Precautionary Approach to Fisheries. Part 2: Scientific Papers.* Prepared for the Technical Consultation on the Precautionary Approach to Capture Fisheries. Lysekil, Sweden, 6-13 June, 1995. FAO Technical Paper No. 350. Rome: FAO.

GESAMP (Joint Group of Experts on the Scientific Aspects of Marine Pollution). 1990. *The State of the Marine Environment.* Blackwell Publications, Oxford, UK. and UNEP Regional Seas Reports and Studies No. 115.

Gjerde, K. M. and Pullen, J. S. H. 1997. Ensuring Respect for Particularly Sensitive Sea Areas. *Coastal Zone '97: Conference Proceedings.* ed. M. C. Miller and J. Cogan. Boston: Coastal Zone '97. pp. 394-396.

Gold, E. 1996. *Canadian Maritime Law.* Marine and Environmental Law Program, Dalhousie Law School. Ninth edition.

Graham, R., Stalport, N., VanderZwaag, D., Lamson, C., Butler, M. and Boyle, D. 1992. The protection of special marine and coastal areas. pp. 341-392 In VanderZwaag, (ed.). *Canadian Ocean Law and Policy.* Butterworths Canada Ltd., Toronto.

Gray, J. S. 1995. Environmental Monitoring -- Feedback Monitoring -- The Scandanavian Experience. *Marine Environmental Management: Review of 1994 and Future Trends.* Earll, R (ed.), pp. 67-72.

Great Barrier Reef Marine Park Authority. 1994. *A 25 Year Strategic Plan for the Great Barrier Reef World Heritage Area: Keeping it Great.* GBRMPA.

Great Barrier Reef Marine Park Authority. 1996. *Annual Report 1995-1996.* GBRMPA.

Gubbay, S. 1995. *Marine Protected Areas: Principles and techniques for management.* Chapman and Hall, London. 227 pp.

Hardin, G. 1968. *The Tragedy of the Commons.* Science. 162, pp. 1243-1248.

Harding, L. E. 1992. Measures of Marine Environmental Quality. *Marine Pollution Bulletin.* 25(1-4). pp. 23-27.

Hausman, J. A. (ed.) 1993. *Contingency Valuation: A Critical Assessment.* Contributions to Economic Analysis, Vol. 220. New York: Elsevier Science

Henriquez, L. R. 1994. Risk Assessment of Offshore Oil and Gas Activities in the Netherlands. *Marine Pollution Bulletin.* 29(6-12), pp. 317-322.

Hutchings, J.A. 1995. Seasonal marine protected areas within the context of spatio-temporal variation in the northern cod fishery. pp. 39-47 In Shackell and Willison (eds). *Marine Protected Areas and Sustainable Fisheries.* SAMPAA, Wolfville, N.S.

International Maritime Organization (IMO). 1991. *Guidelines for the Designation of Special Areas and the Identification of Particularly Sensitive Sea Areas.* Resolution A720(17), adopted November 6, 1991.

IUCN. 1988. General Assembly Resolution GA 17.38. 17th General Assembly of IUCN, San Jose, Costa Rica, February, 1988.

IUCN. 1993. *Parks for Life: Report of the IVth World Congress On National Parks and Protected Areas. Caracas, Venezuela. 10-21 February 1992.* IUCN. Gland, Switzerland.

IUCN. 1995. *The Law of the Sea: Priorities and responsibilities in implementing the Convention.* Part I: Kimball, L.A. Part II: Johnston, D.M., Saunders, P.M. and Payayo, P. A. Marine Conservation and Development Report. IUCN, Gland, Switzerland.

Jensen, K; Moller, J.; Radlow, A. 1991. An Environmental Impact Assessment of the Construction of Bridges and Tunnels Across the Oresund. *12th Baltic Marine Biologists Symposium.* Helsingor, Denmark, Aug. 25-30, 1991. pp. 87-91.

Kelleher, G., Bleakley, C. and Wells, S. 1995. *A Global Representative System of Marine Protected Areas.* 4 volumes. Great Barrier Reef Marine Park Authority, The World Bank, and The World Conservation Union. Washington, D.C.

Kelleher, G. and Kenchington, R.A. 1991. *Guidelines for Establishing Marine Protected Areas.* A Marine Conservation and Development Report. IUCN. Gland, Switzerland. 79 pp.

Kenchington, R. and Agardy T. 1990. Achieving marine conservation through Biosphere Reserve planning and management. *Environmental Conservation.* 17(1). pp. 39-44.

Kenchington, R. and Bleakley, C. 1994. Identifying priorities for marine protected areas in the insular Pacific. *Marine Pollution Bulletin.* 291(3), pp. 3-9.

Keough, M. J., Quinn, G. P., and King, A. 1993. Correlations Between Human Collecting and Intertidal Mollusc Populations and Rocky Shores. *Conservation Biology.* 7: pp. 378-390

Kimball, L. 1996. The possibilities of international law for sustainable use of marine and coastal biodiversity. Paper presented at the *IUCN World Conservation Congress*, 13-23 October, 1996, Montreal, Canada.

Koslow. 1997 CSIRO Division of Fisheries, Hobart, Tasmani, Australia. Personal Communication.

Lester, 1995. Rediscovering the Public Interest in the Outer Continental Shelf Lands *Moving Ahead on Ocean Governance*. ed. B. Cicin-Sain, L.L. Denno. Summaries of Papers from the 1994 Ocean Governance Study Group Conference, University of Delaware, April 9-13, 1994. pp. 79-81.

McGarvey, R. and Willison, J.H.M. 1995. *Rationale for a marine protected area along the international boundary between U.S. and Canadian waters in the Gulf of Maine.* pp. 74-81 In Shackell and Willison (eds.) *Marine Protected Areas and Sustainable Fisheries.* SAMPAA, Wolfville, N.S.

McNeill, S.E. 1994. The selection and design of marine protected areas: Australia as a case study. *Biodiversity and Conservation.* 3(7), pp. 586-605.

Meltzer, E. 1995. *Overview of Marine Conservation Issues in Atlantic Canada.* Mimeo prepared for the Canadian Arctic Resource Committee. Excerpts in Beckman, L. 1996. *Seas the Day: Toward a National Marine Conservation Strategy for Canada.* National Marine Conservation Strategy Programme (Canadian Arctic Resources Committee and Canadian Nature Federation).

Meltzer, E. 1996. *Guidelines for Offshore Marine Protected Areas in Canada.* Volume 1 and 2. Unpublished consultants report prepared for the Department of Fisheries and Oceans.

Meltzer, E. 1997. *The International and Domestic Juridical Framework for Establishing MPAs under the Canada Wildlife Act.* Unpublished consultants report prepared for the Canadian Wildlife Service.

Mitchell, R. C. and Carson, R. T. 1989. *Using Surveys to Value Public Goods: The Contingent Valuation Method.* Washington, DC: Resources for the Future.

Morgan, C. 1994. Environmental Management Systems -- Opportunities and Threats. *Marine Environmental Management.* Earll, R. (ed.). 1(17), pp. 69-72.

Native Council of Nova Scotia. 1993. *Mi'Kmaq Fisheries (Netukulimk): Towards a Better Understanding.* Truro, Nova Scotia: Native Council of Nova Scotia, Language Program.

Norse, E.A. (ed.) 1993. *Global Marine Biological Diversity: A strategy for building conservation into decision making.* IUCN/CMC/WWF/UNEP/World Bank.

Parks Canada. 1995. *Sea to Sea to Sea: Canada's National Marine Conservation Areas System Plan.* Ottawa: Parks Canada.

Partidario, M. R. 1993. Anticipation in Environmental Assessment: Recent Trends at the Policy and Planning Levels. *Impact Assessment.* 11(1), pp. 27-45.

Pauly and Christiansen. 1995. *Primary Production Required to Sustain Global Fisheries.* Nature. 374(6519), pp. 255-257.

Pearce, F. 1995. How to Build Greener Bridges. *New Scientist.* 145(1961), pp. 25-29.

Pearce, D., Markandya, A., and Barbier, E. B. 1989. *Blueprint for a Green Economy.* London: Earthscan Publications.

Peet, G. Ocean Management in Practice. *Ocean Management in Global Change.* L.S. Ganesh, ed. London: Elsevier Applied Science. pp. 39-56.

Quinn, J. F., Wing, S. R. and Botsford, L. W. 1993. Harvest Refugia in Marine Invertebrate Fisheries: Models and Applications to the Red Sea Urchin, Strongylocentrotus franciscanus. *American Zoologist.* 33: pp. 537-550.

Recchia, C. and Broadhead, J. 1995. Marine Protected Areas. In *Protecting Canada's Endangered Spaces: An Owner's Manual.* World Wildlife Fund (WWF), Toronto.

Roberts, C.M. 1997. Ecological advice for the global fisheries crisis. *Trends in Ecology and Evolution.* 12(1), pp. 35-38.

Roberts, C.M. and Polunin, N.V.C. 1991. Are marine reserves effective in management of reef fisheries? *Reviews in Fish Biology and Fisheries.* 1, pp. 65-91.

Roberts, C.M. and Polunin, N.V.C. 1993. Marine reserves: simple solutions to managing complex fisheries? *Ambio* 22(6), pp. 363-368.

Rowley, R.J. 1992. *Impacts of Marine Reserves on Fisheries: A report and review of the literature.* Science & Research Series No. 51. Department of Conservation, Wellington, New Zealand. 50 pp.

Rowley, R.J. 1994. Marine reserves in fisheries management. *Aquatic Conservation: Marine and Freshwater Ecosystems* 4, pp. 233-254.

Salm, R.V. and Clark, J.R. 1989. *Marine and Coastal Protected Areas: A guide for planners and managers.* !UCN, Gland, Switzerland.

Salm, R. and Price, P. 1995. Selection of marine protected areas. pp. 15-31 In Gubbay. *Marine Protected Areas: Principles and techniques for management.* Chapman and Hall, London.

Shackell, N. and Willison, J. H. 1995. *Marine Protected Areas and Sustainable Fisheries.* Proceedings of a symposium on marine protected areas and sustainable fisheries, Second International Conference on Science and the Management of Protected Areas, Dalhousie University, Halifax, Nova Scotia, 16-20 May, 1994. Wolfville, N.S.: Science and Management of Protected Areas Association.

Steele, J.H. 1985. Comparison of marine and terrestrial ecological systems. *Nature.* 313, pp. 355-358

United Nations. 1972. *Convention Concerning the Protection of the World Cultural and Natural Heritage* (World Heritage Convention). Nov. 16, 1972. T.I.A.S. 8226, 27 U.S.T. 37, 11 I.L.M. 1358.

United Nations. 1973. *International Convention for the Prevention of Pollution from Ships.* 1340 UN.T.S. 184, 12 I.L.M. 1319 (1973).

United Nations. 1978. *Protocol Relating to the Convention for the Prevention of Pollution from Ships.* 1340 UN.T.S. 61, 17 I.L.M. 546 (1978).

United Nations. 1982. *United Nations Convention on the Law of the Sea.* A/CONF 62/122, 21 I.L.M. 1261.

United Nations. 1987. *Development of Marine Areas Under National Jurisdiction: Problems and Approaches in Marine Policy-Making, Planning and Management.* Report of the Secretary General, Economic and Social Council. New York: United Nations.

United Nations. 1992. *Convention on Biological Diversity.* 31 I.L.M. 818.

United Nations. 1994. *The Precautionary Approach to fisheries with Reference to Straddling Fish Stocks and Highly Migratory Fish Stocks.* UN Conf. on Straddling Fish Stocks and Highly Migratory Fish Stocks. New York, Mar. 14-31, 1994. A/Conf. 164.INF/9: 35 pp.

United Nations. 1995. *United Nations Convention on Straddling and Migratory Fish Stocks,* New York, 1995.

United Nations Conference on Environment and Develepment (UNCED). 1992a. *Rio Declaration on Environment and Development.* UNCED, June 3-14, 1992.

United Nations Conference on Environment and Development (UNCED). 1992b. *Agenda 21: Programme of Action for Sustainable Development.* A/CONF. 151/26/Rev.1, Vol.1.

United Nations Environment Programme (UNEP). 1991. *Human Development Report 1991.* Oxford: Oxford University Press.

United Nations Environment Program (UNEP). 1995. *Global Programme of Action for the Protection of the Marine Environment from Land-based Activities.* Reykjavik, May 19, 1995, UNEP/ICL/IG/1/2/Rev. 1.

United States, 1953. *Outer Continental Shelf Lands Act.* 43 U.S.C. 1331 et seq.

VanderZwaag, D. 1995. *Canada and Marine Environmental Protection: Charting a Legal Course Towards Sustainable Development.* London: Kluwer Law International.

Walters, C. and Maguire, J.J. 1996. Lessons for stock assessment form the northern cod collapse. *Reviews in Fish Biology and Fisheries* 6, pp. 125-137.

Weisbord, M. R. 1992. *Discovering Common Ground.* San Franciso, California: Berret-Koehler Publishers, Inc.

Wells, R. G. and Ricketts, P. J. 1996. *Coastal Zone Canada '94, 'Cooperation in the Coastal Zone': Conference Summary.* Vol. 6. Coastal Zone Canada Association, Bedford Institute of Oceanography, Dartmouth, Nova Scotia.

Wolfenden, J Cram, F. and Kirkwood. B. 1994. Marine reserves in New Zealand: a survey of community reactions. *Ocean & Coastal Management.* 25(1), pp. 31-51.

World Commission on Environment and Development. 1987. *Our Common Future.* Oxford: Oxford University Press.

Worldwide Fund for Nature (WWF), UK. 1996. *Marine and Coastal Biodiversity Conservation: The International Legal Framework,.*

Zurbrigg, E.J. 1996. *Towards an Environment Canada Strategy for Coastal and Marine Protected Areas.* Canadian Wildlife Service, Hull.